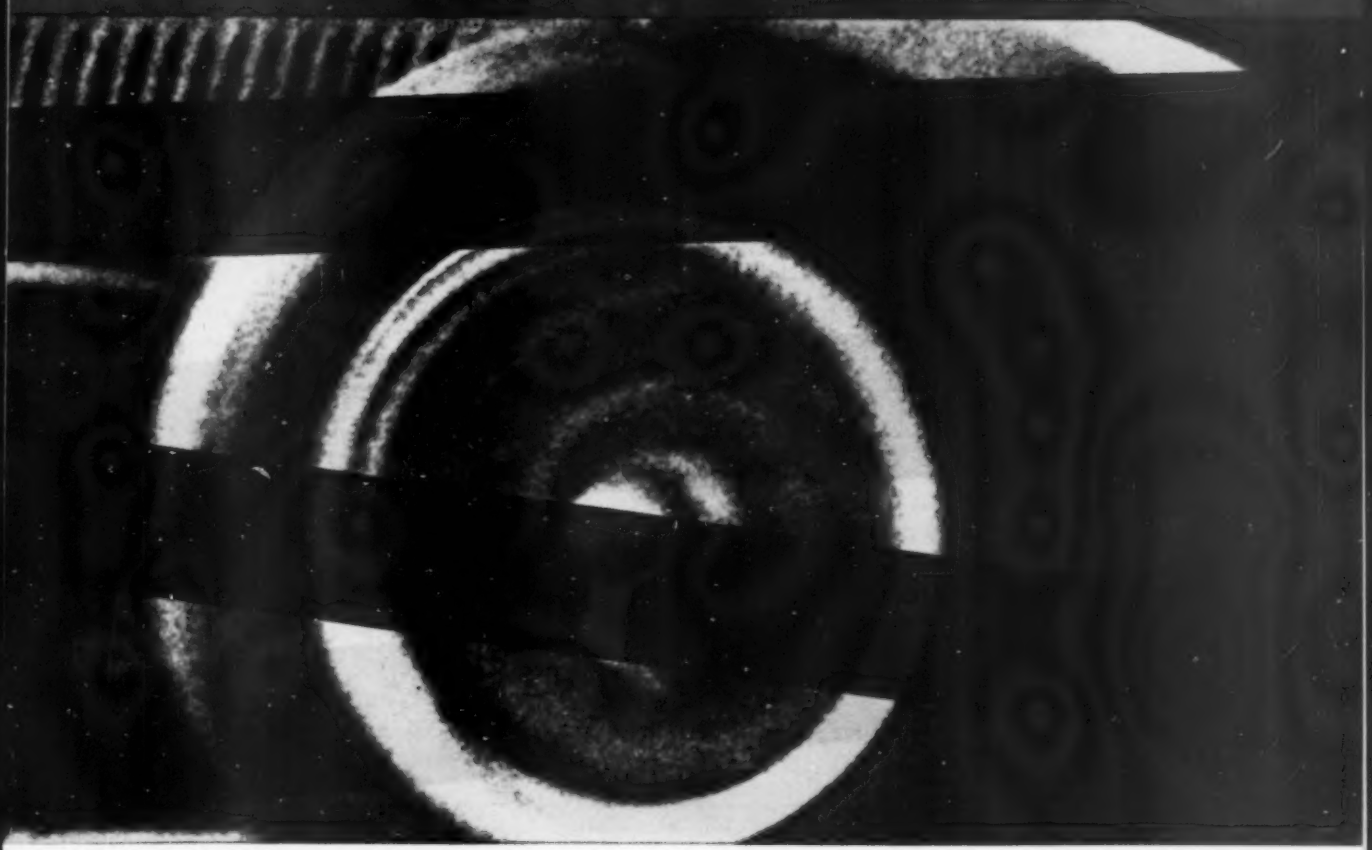
RUBBER and PLASTICS WEEKLY

VOLUME 141 NO. [illegible] JULY 1 1961 ONE SHILLING



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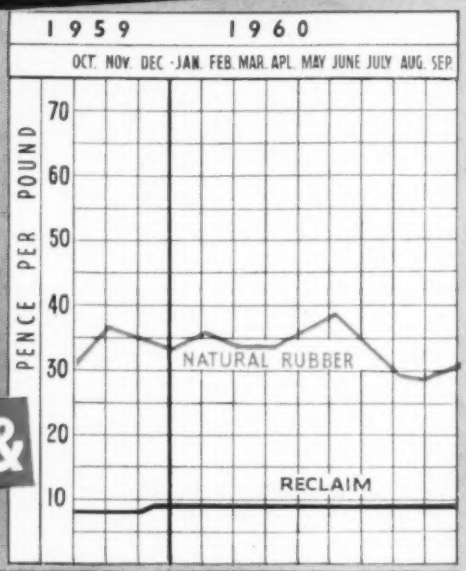

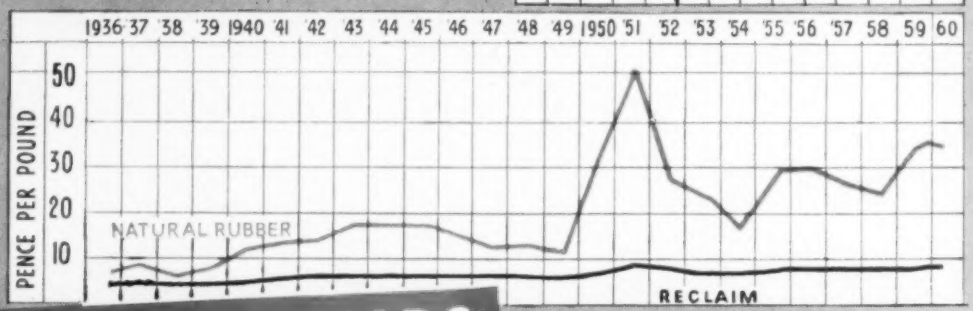

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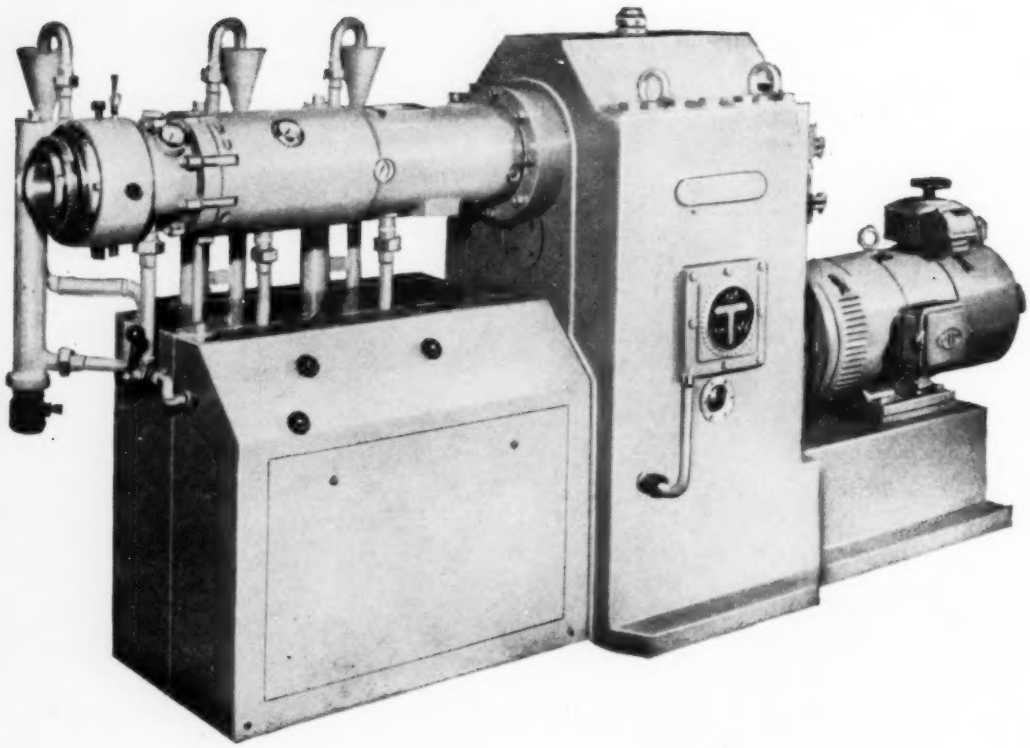

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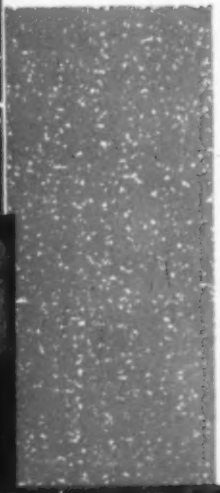

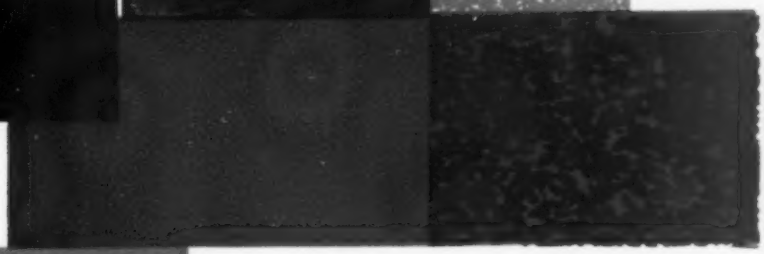

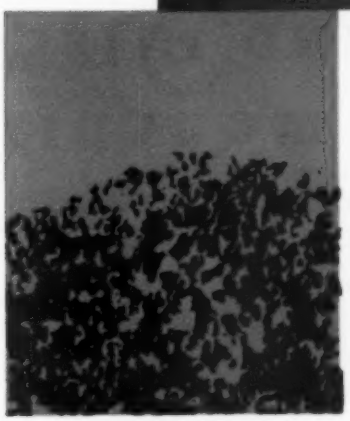

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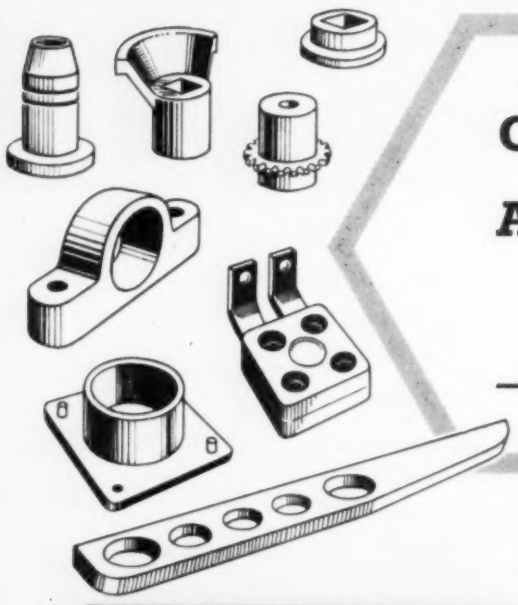

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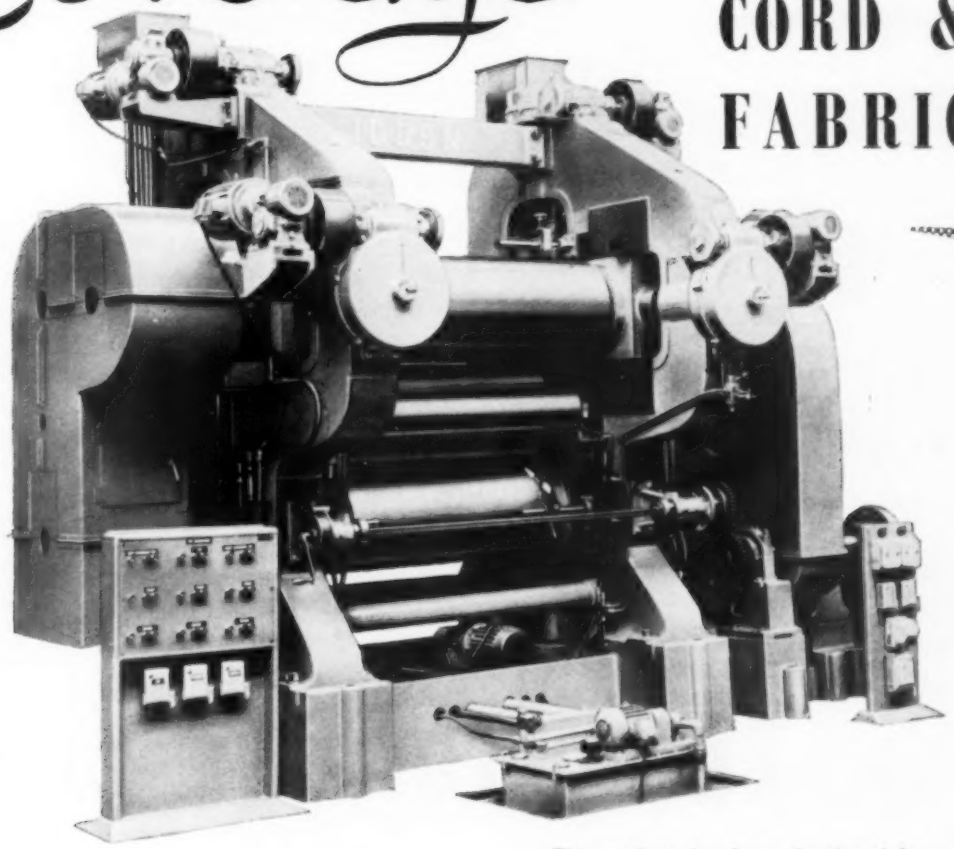

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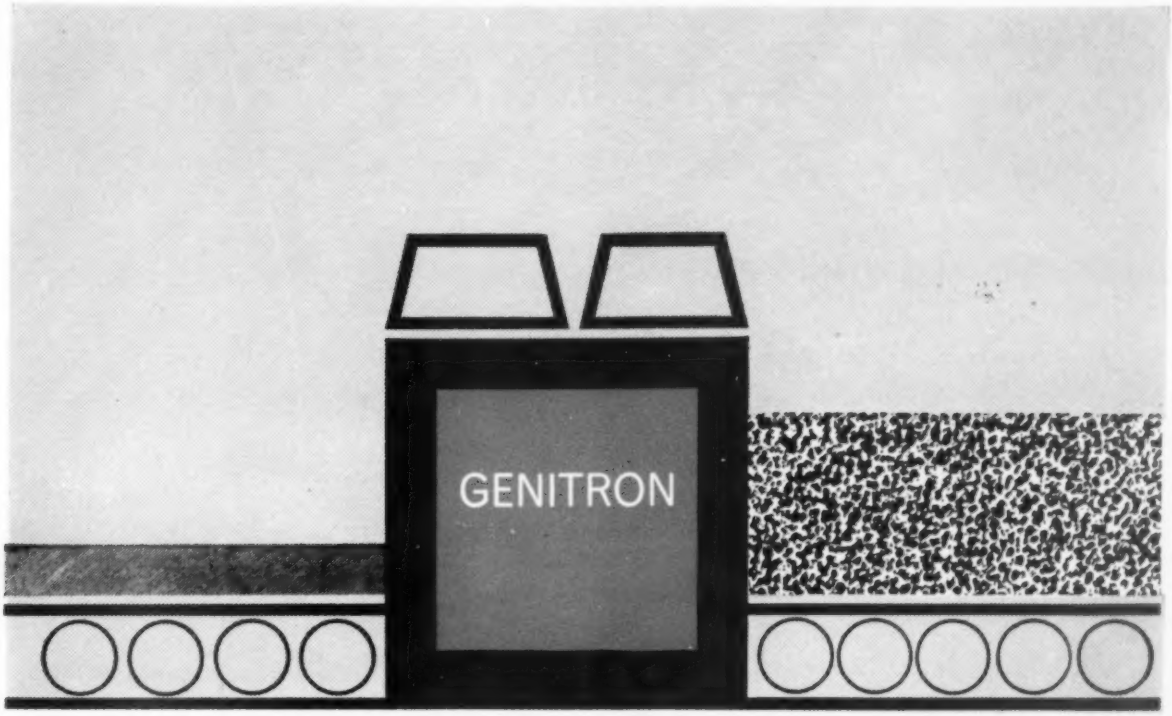

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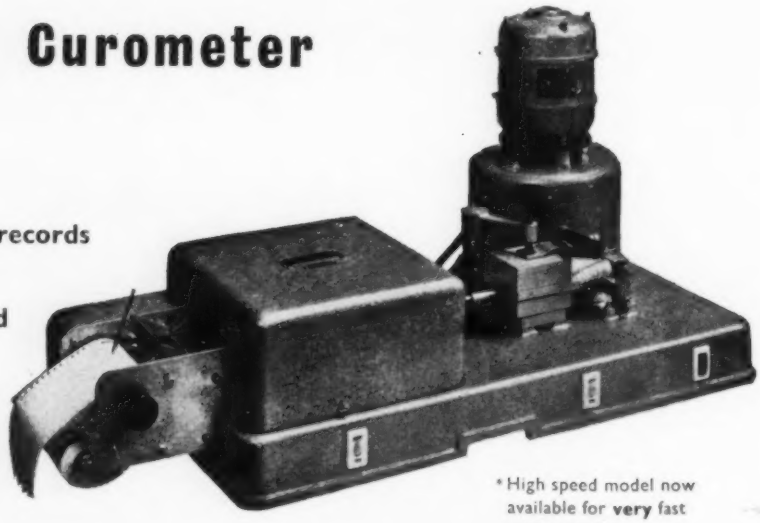

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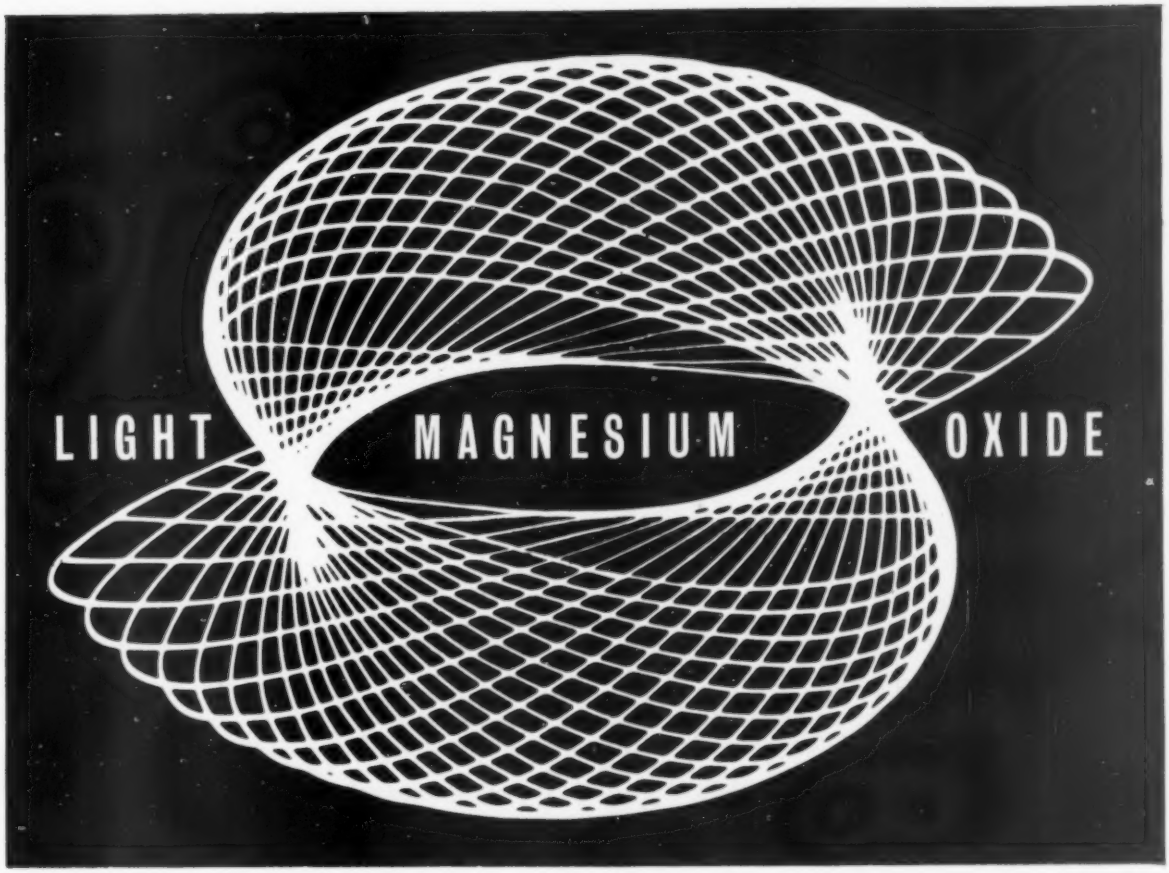

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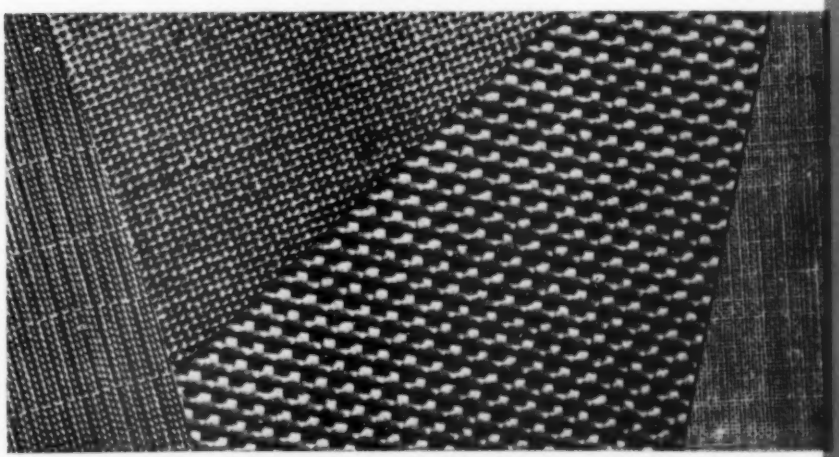

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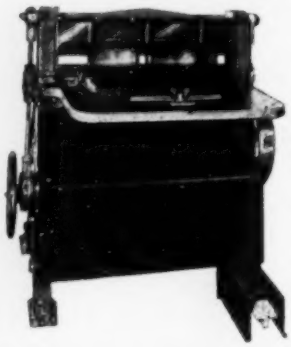

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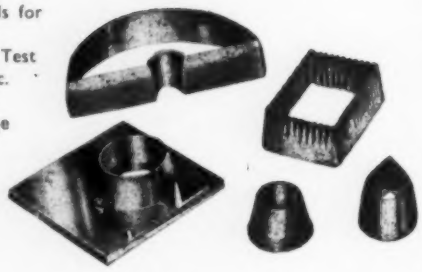

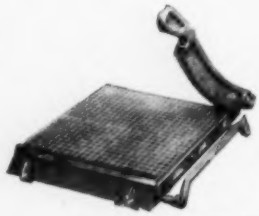

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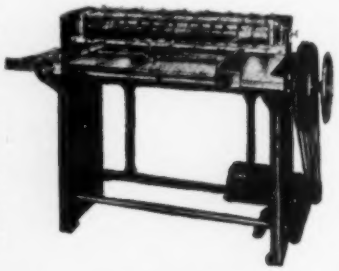

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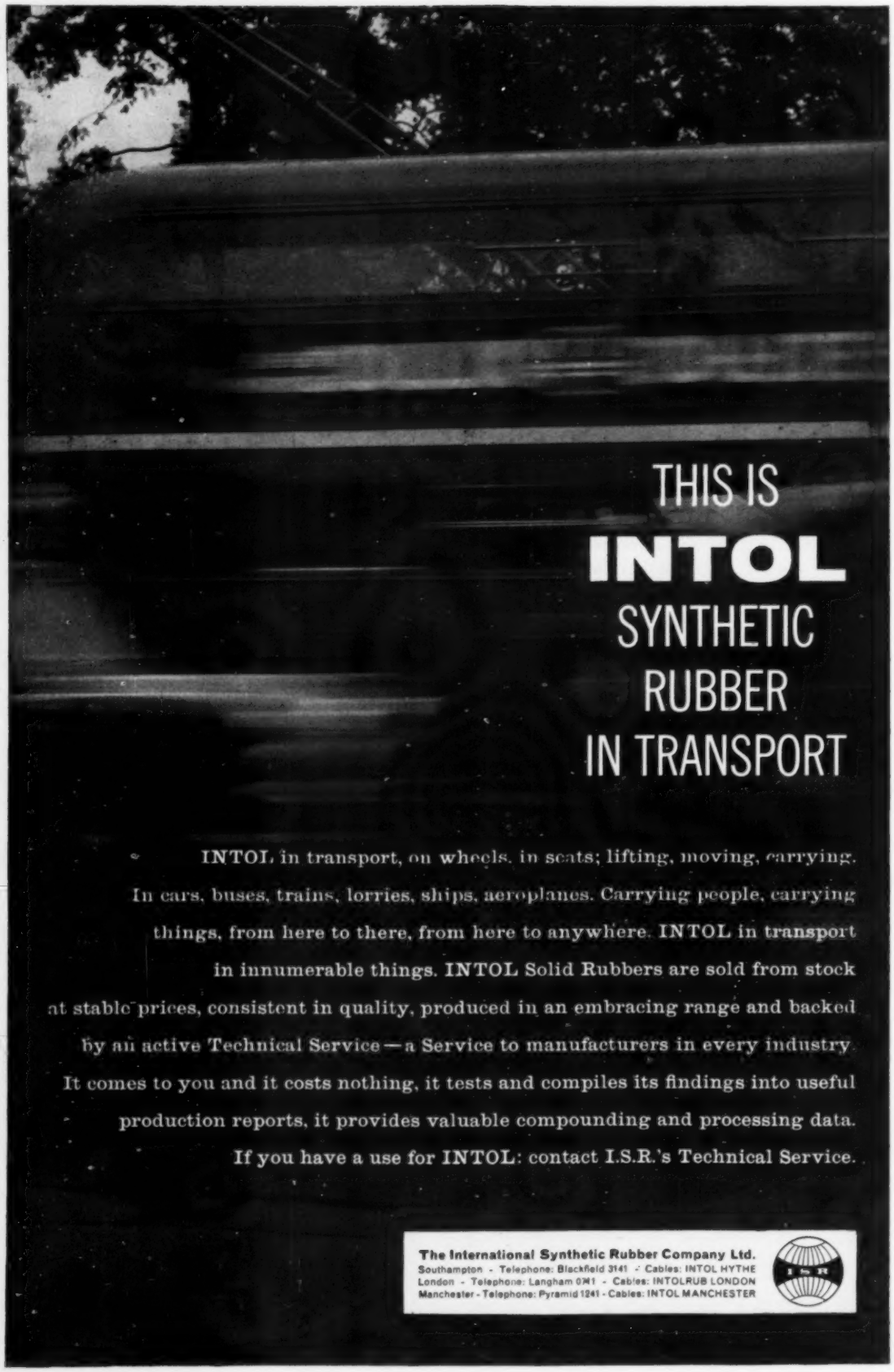

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Formerly 'Rubber Journal and International Plastics'

Volume 141 *IN ITS 77th YEAR* **No. 1**

July 1 1961

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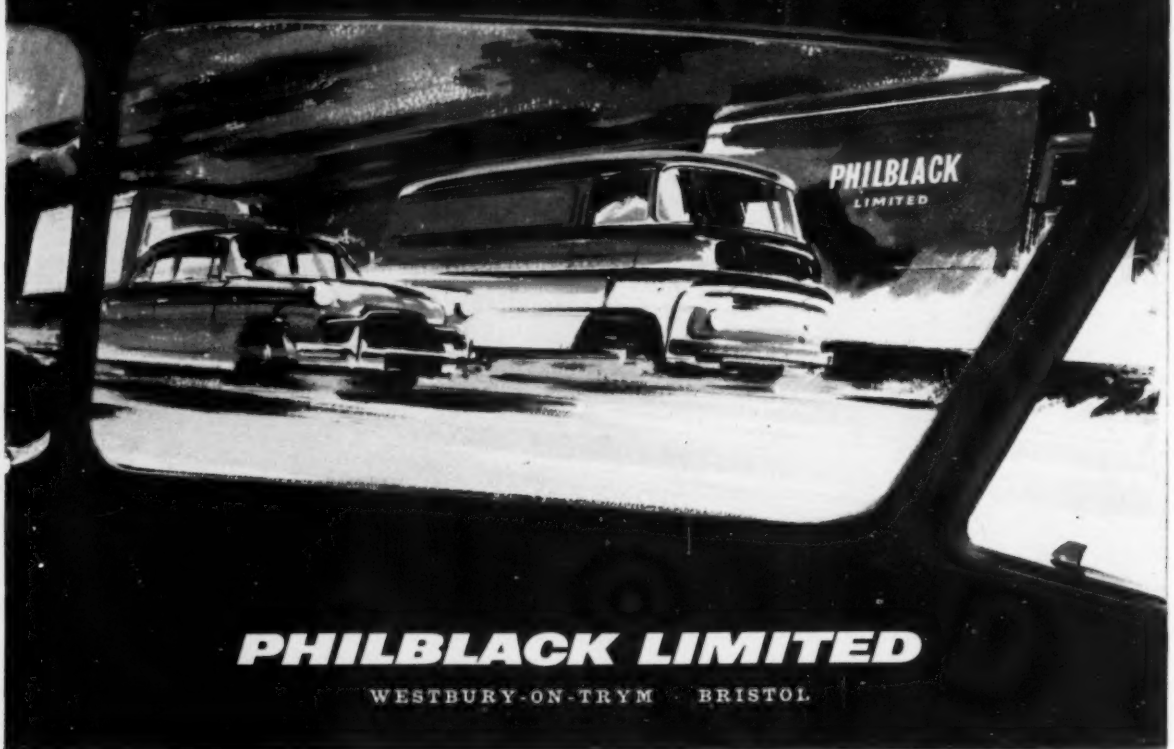

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YSA 98

NOTES of the WEEK

Really International

INTERPLAS — the international plastics exhibition at Olympia — came to a close this week. It is still too early, perhaps, to put the exhibition into perspective. From the individual exhibitor's point of view not many actual orders are ever placed at an exhibition of this kind: it is only in the months following, when the enquiries begin to pay dividends, that he can make a real assessment.

One striking thing was the really international nature of the exhibition. Nowadays any exhibition that contains a stand taken by a continental firm, and that is visited by a small party from Germany, say, seems to call itself international. Interplas, however, even more than the 1959 exhibition, fully justified the title. Looking through the enquiries received on the *RPW* stand we can see: Mexico, Japan, Italy, Germany, France, Sweden, USA and many other countries; even one from the Philippines.

An Eye on the Opposition

THERE were few new plastics applications at Interplas. Most of the products on show were the result of the consolidation and improvement of existing products — although in certain fields, such as building, there were some interesting things to be seen. A polypropylene cistern and other similar applications on I.C.I.'s stand, which was devoted to a 'plastics in building' display attracted a good deal of attention. On the clothing side foambacks were featured for the first time at a UK plastics exhibition, and there is clearly great scope for development here.

But, on the whole, the displays reflected that on many fronts the plastics industry is set for a period of consolidation. This by no means lays down a limit for expansion. The industry has come to be regarded by the public as a kind of bottomless conjurer's hat, from which is produced an endless stream of new products. Much work still needs to be done, however, after the products have come out of the hat. One aspect of this work lies in the competition with products made of the traditional materials.

There is increasingly less need to reiterate that plastics are materials in their own right. The battle is entering into another phase. Traditional materials are being spurred into action — and keener competition. The leather industry, for example, has taken some very hard knocks from pvc. Although it still uses archaic slogans in its advertising — 'the owners of this car chose real leather' — it is, according to the trade paper *Shoe and Leather Record*, at last waking up: 'The tanners, so it seems, have assessed the situation, have taken a long, hard look at the worst — and the best — that synthetics can do for the end products and have decided that the proper form of defence is attack. The tanners are in militant mood. They are also, possibly for the first time in a very long history beginning to get together'. A leather industry official in USA has said: 'The leather industry must accelerate its research programme and the development of adequate means to evaluate the subtle properties of leather in comparison with competitive materials'. All this is happening in an industry which, up till now, has been comparatively disorganized. The attitude is also building up on a much larger scale in an industry which is organized and has immense resources — the metals industry. The light metals, in particular, are making extensive preparation for competition with plastics that will impinge on their field. It is interesting to reflect from this that, just as natural rubber has been stimulated to carry out more research and active marketing by the advent of synthetics, so other traditional materials are learning a sales lesson from plastics. It means that business will be keener, new traditionally held applications will be harder to capture — but the enormous display at Interplas showed quite definitely that the plastics industry has the resources to respond to the situation.

A Matter of Definition

IN the formulation of definitions many heads are better than one. One of the subjects dealt with in the 1960 report of the International Rubber Research and Development Board, published last week, is a matter of definition — customs tariffs nomenclature. Many European countries take part in a customs agreement through the Customs Co-operation Council in Brussels. The definitions in force for raw rubber mean that most speciality rubbers — such as superior processing rubbers and masterbatches — are liable to be excluded from the raw rubber class and included amongst semi-manufactured articles, which could mean a different rate of duty. In 1958 the IRRDB communicated to the International Rubber Study Group the unsatisfactory nature of this position. This has been taken up by the Brussels Council, which is now discussing new legal definitions. The revised definitions, which will bear the results of the IRRDB, the Natural Rubber Producers Research Association and the Institut Francais du Caoutchouc putting their heads together, can be expected to be much more satisfactory.

NEWS *Briefs*

£5m. DUNLOP JAPAN PROJECT — SD PLANT FOR STENUNGSUND—DIENE PRICE CUT—GOODRICH PREDICTION — FRENCH SYNTHETIC PROSPECTS

●**France** — The French chemical industry looks forward to a great effort for increasing domestic synthetic rubber production in the coming years, M. Alphonse Rougier, head of the chemical division of the French Ministry of Industry, said in Paris last week. M. Rougier said that France's synthetic rubber consumption was expected to reach 150,000 tons by 1965, compared with last year's 82,000 tons. Total rubber consumption in France last year amounted to 204,000 tons, synthetic accounting for 40%. M. Rougier estimated that, in 1965, overall consumption would total 260,000 tons, synthetic providing 58%.

●**Holland** — Details have now been concluded for I.C.I.'s purchase of Hollandsche Gummifabrieken Weesp, producers of plastics sheet and film and pvc-coated fabrics. The whole of the issued share capital has been acquired at a cost of about £500,000.

●**United States** — Factory production, which suffered the brunt of the recent recession, will increase to a level of 15% higher than that of the first quarter of 1961, A. J. Ashe, director of business research for the B. F. Goodrich Co., told a recent meeting of the Rubber Manufacturers Association. Rubber consumption in the first quarter of next year could be expected to exceed this year's first quarter by 25%, Mr Ashe added. Much of this increase would be accounted for by an increase in original equipment tyres, but replacement tyres and other rubber goods would share in the growth, Mr Ashe predicted.

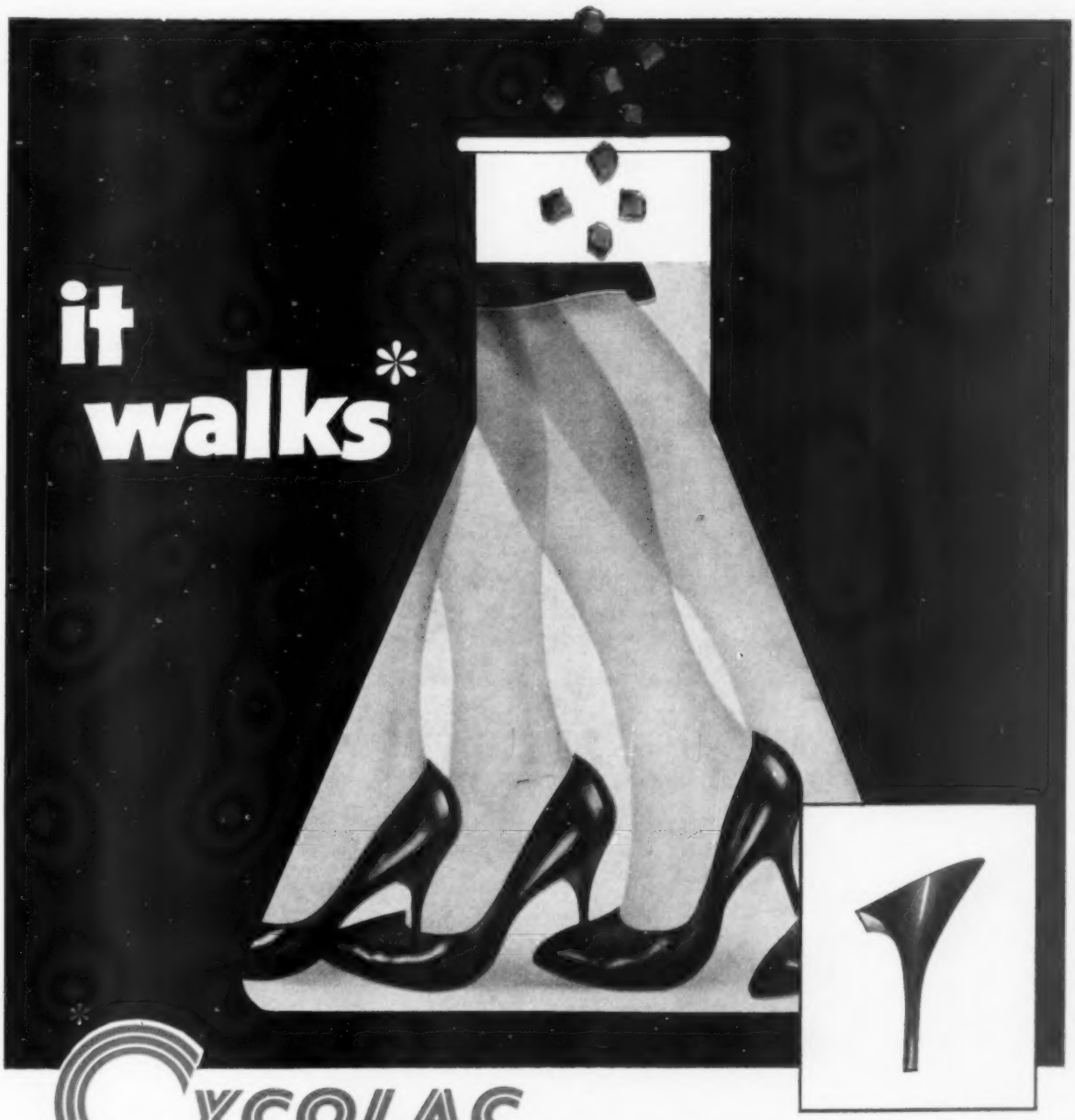
●**Mexico** — Permission has been granted to six private firms to manufacture industrial products from raw materials to be produced by the oil concern Pemex. Another 20 private firms have applied for permits to produce other end products from petrochemicals. Carbon black is to be produced by Negro de Humo, S.A., which will use aromatic extracts from the Pemex Salamanca plant. Fibras Quimicas Mexicanas, S.A., will make nylon fibres, and Quimiac General, S.A., will make cellulose triacetate. Another Mexican project concerns Siclo Amidas, S.A., a joint venture financed by Celulosa y Derivados S.A. of Monterrey, Nylon de Mexico, S.A., of Monterrey, and Celanese Mexicana of Mexico City. This company will construct a 120m. pesos caprolactam plant using cyclohexane from new petrochemical facilities being constructed by Petroleos Mexicanos at Minatitlan.

●**United States** — The Firestone Synthetic Rubber and Latex Co., a subsidiary of the Firestone Tire and Rubber Co., has cut the price of its new diene synthetic rubber by 1½ cents per lb. The new price is 30 cents per lb. delivered in carload or truckload quantities. A company spokesman said that the cut was the result of 'the stabilizing of commercial production in the new multi-million-dollar plant at Orange'. The Orange plant has a capacity of 30,000 long tons a year. In addition, Firestone is building a synthetic plant at Port Jerome, France, which will have an annual capacity of 10,000 long tons of diene rubber per year. The Port Jerome plant, which is scheduled for completion late this year, will serve the European market.

●**Sweden** — Mo och Domsjo Aktiebolag has awarded a contract to Scientific Design Co. Inc., to design and engineer Sweden's first direct air oxidation ethylene oxide plant. A 33m. lb. a year installation will be built at Stenungsund, site of the country's first petrochemical industry. The company will also build an ethylene glycol plant designed by SD. Mo och Domsjo is the fourteenth company to obtain a licence for the SD process, and the plant will be the twentieth ethylene oxide facility designed by SD. Mo och Domsjo will buy ethylene from a steam cracker now being built at Stenungsund by Svenska Esso, an Esso subsidiary. A polythene plant also under construction in the area brings the total investment in the Stenungsund complex to about $40m.

●**Japan** — Duniop Japan has completed plans for a further major expansion at its Kobe and Nagoya factories. These plans, which cover new plant and buildings as well as the modernization of existing plant, will cost £5m. over the next two years. The money will come partly from the company's own resources and bank credits, partly from an increase in the share capital of Dunlop Japan from £1.75m. to £3m. Japanese participation will increase from 29% to 50%, of which Sumitomo Electrical Industries will hold 40% and the Long-Term Credit Bank 10%.

'Don't they do some wonderful things with Plastics these days?'
—543



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Courtaulds Link with Koppers

DEVELOPMENTS EXPECTED IN THE PLASTICS FIELD

THE Courtaulds Group has bought 4% of the common stock of the Koppers Co. Inc., the US plastics and chemical concern, of Pittsburgh, Pennsylvania. The cost is said to have been of the order of £1.5m.

This tie-up is expected to lead to developments in 'areas of mutual interest' — with plastics high on the list. Koppers main plastics products are polystyrene, low density and high density polythene, polythene film and expanded polystyrene. The company also produces styrene monomer. It has 70 plants in North America, and interests in a number of South American countries.

Acetate Plastics

Through its subsidiary, British Celanese, Courtaulds is a leading producer of acetate plastics, including film, extruded sheet and tubing, moulding powder, and wire reinforced sheet and film. Celanese also produces polypropylene, high density polythene and high-impact polystyrene in sheet form.

Until this move Courtaulds had no plastics interests in USA, although it produces viscose rayon there and cellulose film in Canada.

Discussions between the two firms have been taking place over the last few months on the fields outside textiles where technical know-how might be exchanged.

A. W. Knight, a director of Courtaulds, and T. Albert Woods, chairman of Courtaulds North America Inc., have been made directors of Koppers.

Courtaulds sales value figures for the year to March 31 1961, published this week, totalled £172m., compared with £140m. for the previous year. The plastics division of British Celanese increased its turnover and profits. Expansion of both film and moulding powder was put in hand and comes into operation at the end of this year.

Too Many Trade Fairs?

At the second meeting of the policy committee of the EFTA plastics associations, held in London last week, Finland was represented for the first time.

Among the topics discussed were informative labelling, tariff classification, co-operation with EEC plastics committees, and trade fairs and exhibitions.

Grave concern was expressed at the growing number of plastics trade fairs in Europe. The EFTA plastics associations have agreed to recommend their members to concentrate upon three fairs during 1962 and 1963: Macroplastic, Utrecht (October 18 to 25 1962), Interplas, London (June 12 to 22 1963) and Kunststoffe, Dusseldorf (October 19 to 22 1963).

Maydown Expansion

Du Pont (UK) Ltd. is to construct an isocyanate plant at Maydown, Northern Ireland, it was announced on Thursday (June 29). Construction will commence at the end of this year.

The company's neoprene plant at Maydown went on stream last year.

Spaldings Move to Northern Ireland

A. G. SPALDING and Bros. Ltd., the sports equipment manufacturers, are to transfer their main UK factory from Putney to the Monkstown industrial estate, near Belfast.

The company has leased a 100,000 sq. ft. factory now being built by the Northern Ireland Ministry of Commerce, and installation of machinery and equipment valued at £250,000 is to start in November. Building and equipment of the Monkstown factory will cost a total of about £650,000.

Land has been reserved to allow for doubling the size of the factory, which, the company states, will be more advanced than any factory in Europe in the sports equipment industry.

Spaldings state that the move is being made in order to keep pace with the growing demand for their products. The company will introduce at Monkstown new manufacturing methods on which their research and development division have been working. Within two years the Monkstown factory will employ 400 people.

With the opening of the Monkstown works, manufacture at Putney will cease, but the company's administrative and sales offices, warehouse and service departments will remain at the present address. The UK trade will continue to be served from Putney and from the Scottish depot at St. Andrews.

Spaldings choice of Northern Ireland for their new factory was made after extensive study of possible sites throughout the UK. Reasons for the choice were given by R. F. Sammell, managing director, as: availability of labour; generous grants from the Northern Ireland Government towards the capital cost of new plant.

Hose Dislocation

As a result of the extensive fire on June 21 at the works of the British Moulded Hose Co. Ltd., Watford — a subsidiary of BTR Industries Ltd. — there will be some dislocation in the supply of long length moulded and braided hose.

RPW was told that an early assessment of the position indicated that damage to the production areas of the factory was less severe than elsewhere, and every endeavour was being made to recommence manufacture as soon as possible.

Polymer Cuts SBR Price in Canada

IN an attempt to bolster dropping profits of Canadian tyre and rubber manufacturers the government-owned Polymer Corporation has cut prices in Canada of general purpose SBR by one cent a lb. Prices of some other synthetic types have been cut by smaller amounts.

Prices are unchanged for the USA or abroad where, according to a Polymer official 'we are competitive'. Polymer exports some two-thirds of its total production, with most exports going to the European Common Market.

The new prices are intended to make profitable Canadian tyres and general rubber goods which, according to one manufacturer, 'are almost being given away'. For this reason, it is understood that no changes in retail prices are anticipated by most of Polymer's customers. A Canadian tyre manufacturing official said that, as the average car tyre contained 10lb. of synthetic rubber, the cost saving would be little more than 10 cents per unit.

Socony and Kleemann

Formal offers for the ordinary and preference capital of O. and M. Kleemann by Socony Mobil through Mobil Holdings were posted last week (*RPW* May 27, 785).

The offer indicates that the chairman, Derrick Kleeman, owns 358,781 of the shares — for which Mobil is offering 19s. 6d. each; his brother, Jack Kleeman, 310,084 shares; and their cousin, Harry Kleeman, 498,974 shares.

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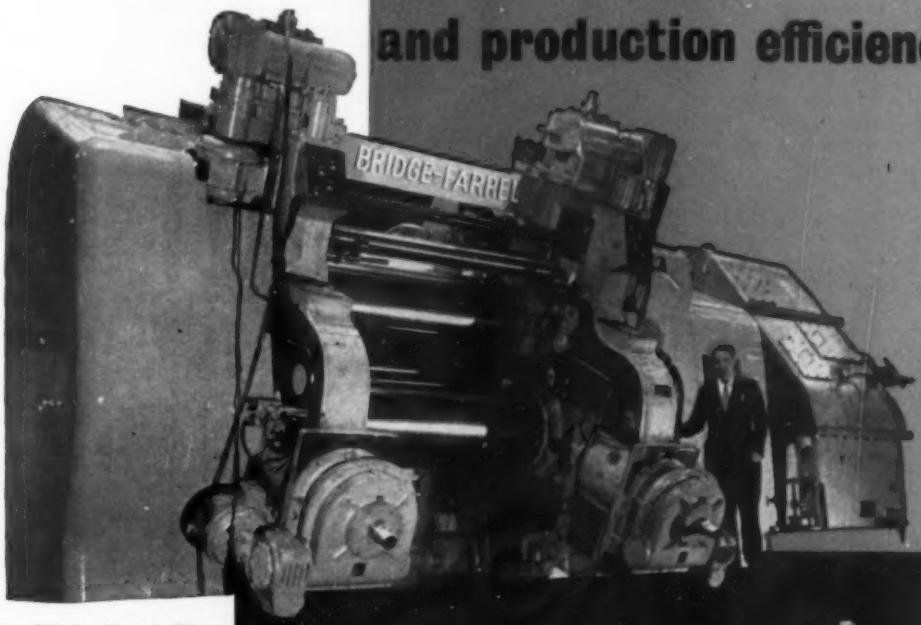

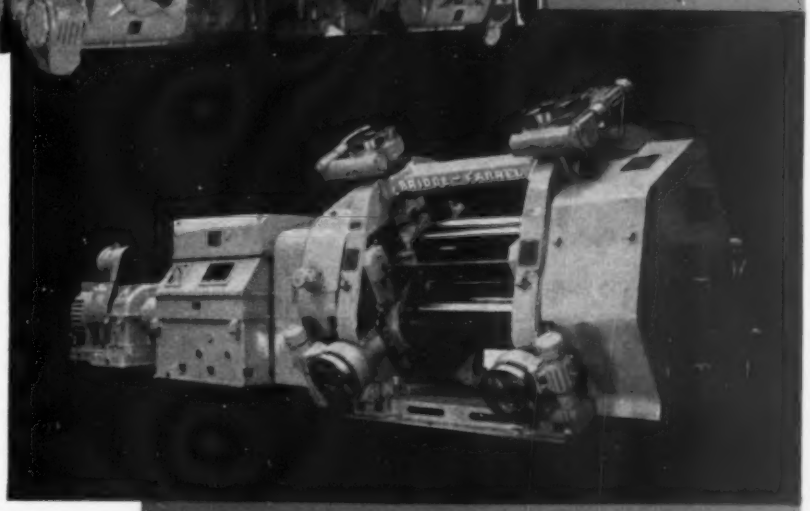

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STABILIZERS FOR PVC—PART 1

Classification of PVC Stabilizers

ANNUAL CONSUMPTION REACHES 8,000 TONS LEVEL

By W. S. PENN, BSc.

This is the first of a series of six articles on pvc stabilizers, the object of which is to help users to chose from the ever-increasing number of stabilizer systems available on a technological basis. This article gives a general introduction and a classification of stabilizers and further articles will discuss each type in more detail, give an outline of the commercial products available in the UK and consider recent developments

IT has always been well known, at least since pvc was used as a technological material, that the polymer is degraded under the influence of heat and light. The mechanism of degradation has never been fully understood but this has not stopped the addition of materials to offset the reaction. These materials are called stabilizers.

The development of stabilizers has taken place at a remarkable rate over the past few years. In the early days, when it was perhaps thought that the liberation of HCl was the main cause of trouble, it was normal to add acid acceptors, usually in the form of basic lead carbonate. Fortunately this stabilizer, still the most commonly used, is an efficient light as well as heat stabilizer so that, probably unexpectedly, it serves both purposes. It has now become increasingly obvious that resistance to UV light absorption is of the greatest importance and stabilizers with this special characteristic have been designed. In addition, antioxidants and UV light absorbers are beginning to be employed.

Balanced Systems

The past few years have seen the adoption of many types of new stabilizers. In addition to the early lead and calcium types, the use of barium, cadmium, lithium, zinc, strontium, tin and purely organic compounds has been adopted. The tin stabilizers, giving possibly the greatest heat resistance and clarity have, hitherto, among the newcomers, received the most attention, but their high cost has dampened enthusiasm to some extent.

Perhaps the most remarkable developments have taken place in synergistic mixtures of barium/cadmium combinations, often with zinc and chelators. Gone are the days, in many cases at least, where one simple chemical would suffice. There are now carefully balanced systems, a series of which can be designed to be used almost anywhere, which may well include all of the following constituents: (1) Barium soap or salt; (2) Cadmium soap or salt; (3) Zinc soap or salt; (4) Chelator (usually triphenyl phosphite); (5) Epoxidized oil or ester; (6) UV light absorber; (7) Antioxidant.

Such a complex system raises the subject of commercial stabilizers. We are now in an age of commercial stabilizers since it is becoming very common to sell not just say barium stearate but a complex mixture under a trade name. The trend is inevitable with modern demands for rigid vinyls, plastisols, high speed calendering (with plate-out) and so on. Clearly the manufacturer is in a better position than the consumer to carry out extensive research into pvc stabilization which means that it will become essential to use the supplier laboratories and proprietary products.

Increasing Complexity

The stabilizer industry is now big business. In this country, with pvc compound consumption approaching 200,000 tons per annum (based on a usage of about 130,000 tons of home and imported polymer and some imported compound) the stabilizer consumption will be about 8,000 tons per annum assuming an average use of say 4phr. To meet this demand the stabilizer manufacturers and their products are increasing rapidly so that the user has a rather bewildering choice.

The object of the present series of articles is to help make this choice on a technological basis. Although a brief review of the theory of degradation is given by way of introduction, the main object is to classify the stabilizers, consider recent developments, discuss their use for various compounds and processing conditions and to give an outline of commercial products available in the UK. It is now not good enough merely to give a general account of 'pure' stabilizers since there are so many more combinations sold under trade names. These are so important that no review of stabilizers would be complete without them.

Definitions

A few definitions of terms to be met within this review of stabilizers are useful.

Stabilizers

A stabilizer is a chemical compound which delays the degradation of pvc and its copolymers under the influence of heat and light. It may be essentially a heat stabilizer or light stabilizer although all stabilizers have at least some characteristics of both.

Chelators

These materials, also called chelating agents, do not normally have any stabilizing action of their own. They are, however, used extensively with stabilizers when they deactivate the chloride degradation products formed and minimize colour development.

UV Light Absorbers

Chemicals that absorb light, or reduce its transmission in the 300-400mμ or ultraviolet light region. The most common are substituted benzophenones.

Synergistic Mixtures

If one stabilizer is mixed with another and the resulting protection afforded is greater than either of the constituents then the mixture is said to behave synergistically.

Co-Precipitated Systems

Some simple mixtures of soaps are quite effective but they become even more efficient if they are co-precipitated during manufacture.

Plate-Out

The coloured stains formed particularly on calender bowls at high speeds but also on the surfaces of moulds.

Degradation Mechanism

When pvc compounds are exposed in service to the action of heat and light, sooner or later degradation will commence.[1,2] It will be manifested in the first instance by a change of colour, usually yellowing. This will be followed by a very gradual deterioration of physical and electrical properties and ultimately cracking and disintegration of the compounds will result.

The colour changes which usually

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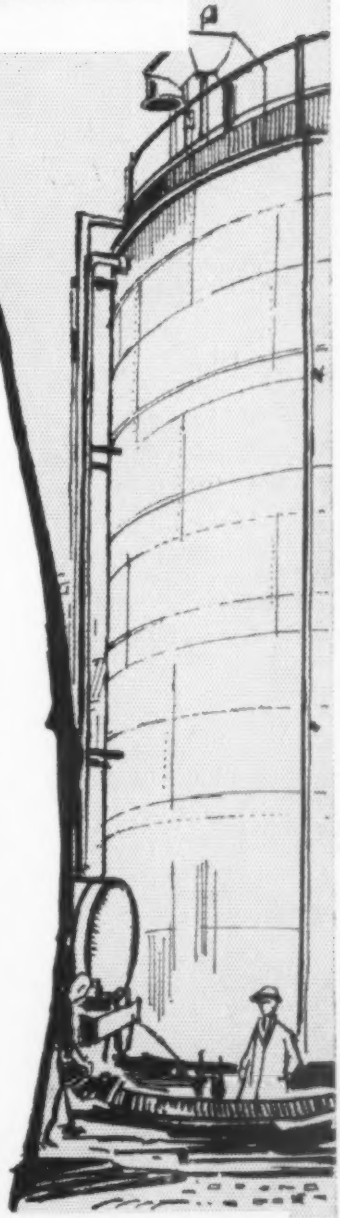

. . . have been since 1925, in fact, when I joined as a lab. boy. Today, I'm manager of the company's sulphuric acid plants—and I wouldn't change my job for anything. I feel sure I'm one of a team, and that's the way it's always been here ever since the Berk brothers founded the company more than ninety years ago. My own work gives me practically a direct link with them as it happens. You see, sulphuric acid was the very first acid this firm produced and we've been improving our production methods all through the years. Now, of course, we manufacture considerable quantities and one of my jobs is to look after the storage tank—the largest in Europe—which holds the molten sulphur from which the acid is produced. Today, Berk acid is used for more batteries than any other made in Britain. But that certainly isn't the only chemical we make. I suppose our products touch on almost every branch of chemicals there is—each developed by experts to perform its task to perfection. A case in point is the group of Berk PVC Stabilisers. Here are six of these, each formulated for a specific purpose. They are:

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DYPHOS (dibasic lead phosphate)
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TEMEX (metal salt-organic complexes)
FLOMAX (liquid barium cadmium complexes)
NALZIN (liquid zinc organic complex)

For further information of PVC Stabilisers or for advice on any chemical problem—ask Berk.

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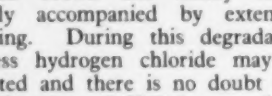
take place when pvc is heated are to light yellow, dark yellow, orange, reddish brown and finally black, usually accompanied by extensive charring. During this degradation process hydrogen chloride may be detected and there is no doubt that the liberation of HCl is one of the results of the reaction. The removal of hydrogen chloride molecules results in the formation of a polyene structure —



This is one of the systems responsible for colour development.

The longer the heat treatment the greater the degradation. This is because the HCl liberated causes internal excitation of the molecule which results in further liberation of HCl and formation of further polyene groups.

Oxidation Products

It is now known from light absorption spectra that carbonyl groups are another result of degradation phenomena. Since such groups are easily formed by the oxidation of unsaturated systems it has been realized that oxidation forms an important secondary phenomenon. It is important to note in this connexion that there are metals which cause the auto-catalytic oxidation of unsaturated systems and these include iron, tin and cadmium, so that their use as stabilizers needs some limitation. The carbonyl groups formed contribute to the colour formation in the compound.

After pvc compounds are made and exposed out of doors they contain at least a small amount of polyene unsaturation. This will absorb light in the ultra-violet range which reactivates the polymer chain and promotes further oxidative degradation and dehydrochlorination. This causes more polyene formation, more oxidation and so on until complete degradation occurs.

The mechanism of pvc degradation, although imperfectly understood may, therefore, for all practical purposes be summarized as follows:

The action of heat on pvc causes dehydrochlorination with the formation of a polyene structure. The HCl liberated tends to cause a chain reaction with further dehydrochlorination and polyene formation. Simultaneously, the presence of oxygen will cause an oxidative reaction resulting in the formation of carbonyl groups. These reactions, caused by heat and oxygen are likely to occur during pvc processing and consequently a heat stabilizer is needed.

In service, the presence of polyene groups causes the absorption of light in the ultra-violet range, which results in further oxidation and dehydrochlorination. A light stabilizer is therefore needed to delay this action as long as possible.

There are undoubtedly other mechanisms of degradation but those described are the most important. They enable the requirements of a perfect stabilizer to be prescribed and this is done in the next section. It may be noted that since modern stabilizer systems do work quite efficiently and are based on the above theories, that they offer some confirmation of the theories.

Stabilizer Requirements

The requirements of a stabilizer may be considered under two headings. First the methods of preventing the various mechanisms described above have to be formulated. Second a miscellaneous collection of subsidiary matters such as compatibility, toxicity, lubricity, etc., have to be considered.

The first group of requirements are as follows:

(1) Since hydrochloric acid is liberated which not only is undesirable in itself but also is responsible for an auto-catalytic reaction, it is clear that it must be removed as fast as it is formed. Thus an acid-acceptor is required.

(2) Dehydrochlorination causes a polyene system to form which not only colours the products but also causes further dehydrochlorination and it is obvious that the structure must be modified.

A unit which causes this de-activation (possibly by a method similar to a Diels-Alder reaction) is required but is not always used. Materials which may be effective include alkylated tin salts, dibasic lead phthalate or phosphite and tribasic lead maleate.

(3) Since oxidation is an important secondary reaction then antioxidants are necessary. They are certainly not used extensively but fortunately materials such as dibasic lead phosphite, organic phosphites and phenols (chelators) and normal lead salicylate have antioxidant properties.

(4) UV light attacks pvc compounds readily and UV light screens are required. There are a number of materials which are effective but, apart from the substituted benzophenones, phenyl salicylate and lead salicylate are reasonably effective and many basic metallic soaps are very useful although the mechanism is not understood.

It will have been noted in the above descriptions that some lead salts are effective in all four requirements so that their extreme value should be kept in mind. Once the lead salts are discarded for one reason or another, then all sorts of complicated systems may be necessary. A consideration of the secondary requirements of stabilizers is as follows:

(5) This item is really an extension of Item (1) above. The acid acceptor should form products with the HCl which are neutral chemically and should be non-ionic so as not to affect electrical properties.

Lead compounds meet these requirements best from the production of an insoluble product point of view, but barium, cadmium, tin, etc., are also satisfactory.

(6) Neither the stabilizer nor its reaction products should have any deleterious effect on the colour, clarity, durability, odour or water-resistance of the compound. Obviously all of these characteristics are not always required so that those appropriate for the job must be considered.

(7) The stabilizer must in some instances be non-toxic.

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There are several methods which can be used, the most obvious being

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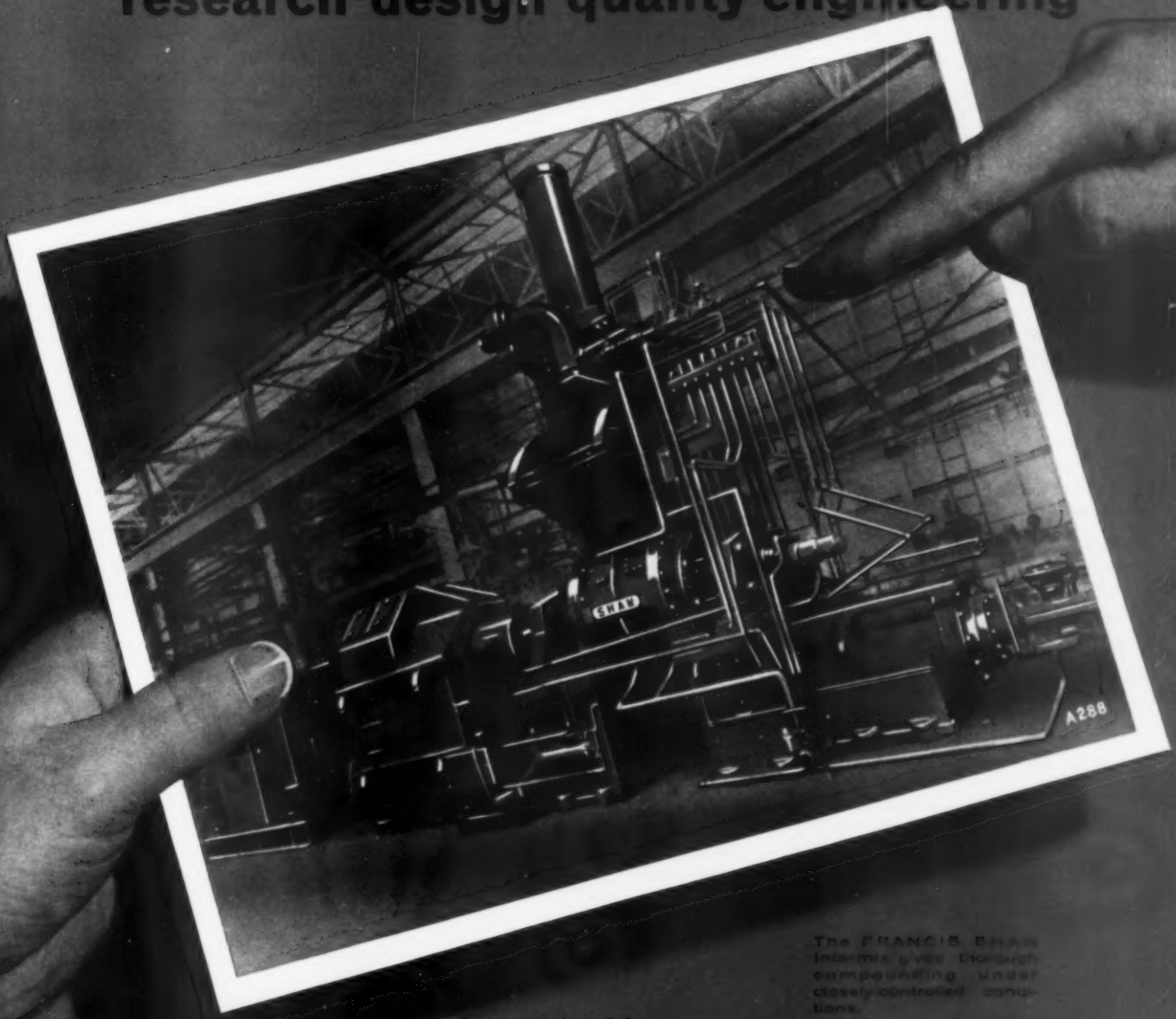

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OVERSEAS AGENTS THROUGHOUT THE WORLD

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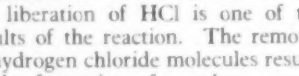
take place when pvc is heated are to light yellow, dark yellow, orange, reddish brown and finally black, usually accompanied by extensive charring. During this degradation process hydrogen chloride may be detected and there is no doubt that the liberation of HCl is one of the results of the reaction. The removal of hydrogen chloride molecules results in the formation of a polyene structure —



This is one of the systems responsible for colour development.

The longer the heat treatment the greater the degradation. This is because the HCl liberated causes internal excitation of the molecule which results in further liberation of HCl and formation of further polyene groups.

Oxidation Products

It is now known from light absorption spectra that carbonyl groups are another result of degradation phenomena. Since such groups are easily formed by the oxidation of unsaturated systems it has been realized that oxidation forms an important secondary phenomenon. It is important to note in this connexion that there are metals which cause the auto-catalytic oxidation of unsaturated systems and these include iron, tin and cadmium, so that their use as stabilizers needs some limitation. The carbonyl groups formed contribute to the colour formation in the compound.

After pvc compounds are made and exposed out of doors they contain at least a small amount of polyene unsaturation. This will absorb light in the ultra-violet range which reactivates the polymer chain and promotes further oxidative degradation and dehydrochlorination. This causes more polyene formation, more oxidation and so on until complete degradation occurs.

The mechanism of pvc degradation, although imperfectly understood may, therefore, for all practical purposes be summarized as follows:

The action of heat on pvc causes dehydrochlorination with the formation of a polyene structure. The HCl liberated tends to cause a chain reaction with further dehydrochlorination and polyene formation. Simultaneously, the presence of oxygen will cause an oxidative reaction resulting in the formation of carbonyl groups. These reactions, caused by heat and oxygen are likely to occur during pvc processing and consequently a heat stabilizer is needed.

In service, the presence of polyene groups causes the absorption of light in the ultra-violet range, which results in further oxidation and dehydrochlorination. A light stabilizer is therefore needed to delay this action as long as possible.

There are undoubtedly other mechanisms of degradation but those described are the most important. They enable the requirements of a perfect stabilizer to be prescribed and this is done in the next section. It may be noted that since modern stabilizer systems do work quite efficiently and are based on the above theories, that they offer some confirmation of the theories.

Stabilizer Requirements

The requirements of a stabilizer may be considered under two headings. First the methods of preventing the various mechanisms described above have to be formulated. Second a miscellaneous collection of subsidiary matters such as compatibility, toxicity, lubricity, etc., have to be considered.

The first group of requirements are as follows:

(1) Since hydrochloric acid is liberated which not only is undesirable in itself but also is responsible for an auto-catalytic reaction, it is clear that it must be removed as fast as it is formed. Thus an acid-acceptor is required.

(2) Dehydrochlorination causes a polyene system to form which not only colours the products but also causes further dehydrochlorination and it is obvious that the structure must be modified.

A unit which causes this de-activation (possibly by a method similar to a Diels-Alder reaction) is required but is not always used. Materials which may be effective include alkylated tin salts, dibasic lead phthalate or phosphite and tribasic lead maleate.

(3) Since oxidation is an important secondary reaction then antioxidants are necessary. They are certainly not used extensively but fortunately materials such as dibasic lead phosphite, organic phosphites and phenols (chelators) and normal lead salicylate have antioxidant properties.

(4) UV light attacks pvc compounds readily and UV light screens are required. There are a number of materials which are effective but, apart from the substituted benzophenones, phenyl salicylate and lead salicylate are reasonably effective and many basic metallic soaps are very useful although the mechanism is not understood.

It will have been noted in the above descriptions that some lead salts are effective in all four requirements so that their extreme value should be kept in mind. Once the lead salts are discarded for one reason or another, then all sorts of complicated systems may be necessary. A consideration of the secondary requirements of stabilizers is as follows:

(5) This item is really an extension of Item (1) above. The acid acceptor should form products with the HCl which are neutral chemically and should be non-ionic so as not to affect electrical properties.

Lead compounds meet these requirements best from the production of an insoluble product point of view, but barium, cadmium, tin, etc., are also satisfactory.

(6) Neither the stabilizer nor its reaction products should have any deleterious effect on the colour, clarity, durability, odour or water-resistance of the compound. Obviously all of these characteristics are not always required so that those appropriate for the job must be considered.

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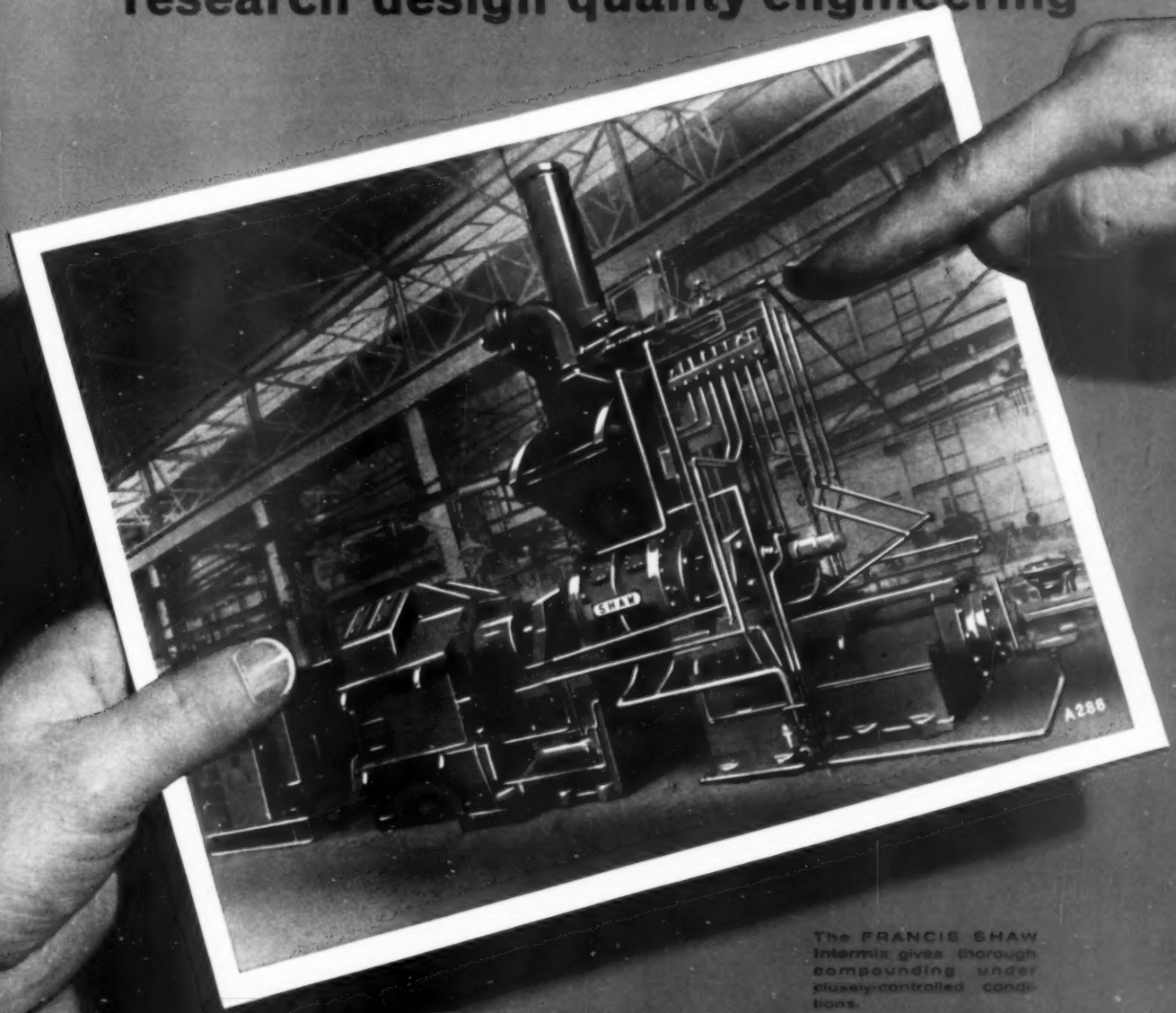

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the chemical composition. Then there is the end usage of the material such as heat stability, light stability, for electrical purposes, for rigid or flexible and so on. There are stabilizers which can only be used in translucent, transparent or opaque compounds; those which are toxic and those which are not. Various minor differences can also be found.

It is obviously a difficult problem to classify stabilizers in a useful yet simple manner. The scheme outlined below, therefore, is a compromise, but has the merit that each group has certain properties in common; is quite distinct from other groups, and has 'group' stabilizer properties. Five groups have been created as follows: I—Lead salts or soaps; II—Other metal salts and soaps (except tin); III—Tin salts and soaps; IV—Miscellaneous and Organic stabilizers and/or chelators; V—Mixed stabilizers.

A brief account of each of these groups is given below. They are dealt with in detail in subsequent articles.

Group I

Generally speaking the lead compounds have good all round properties, but they cannot be used where ingestion is possible or where sulphide staining is likely to occur. It is possible to create Sub-Group IA consisting of lead salts which give opaque compounds and Sub-Group IB consisting of lead salts which give translucent or transparent compounds.

Group II

The principal constituents of this group are salts and soaps of calcium, cadmium, barium, zinc, lithium, strontium and aluminium. Once again sub-groups can be created but in a different way to the lead salts. Most of the salts of Group II give translucent or transparent stocks so that the division used in the case of lead compounds is non-existant. If sub-groups are really necessary there is Sub-Group IIA consisting of those salts which have better heat resisting than light resisting characteristics (barium, calcium, lithium, zinc and aluminium) and Sub-Group IIB with better light than heat resisting characteristics, namely cadmium and strontium salts.

Group III

The tin compounds are perhaps the most remarkable, although the most expensive of all stabilizers. With one or two possible exceptions they give the greatest transparency and heat resistance in clear and rigid compounds. The best known 'straight' chemicals are dibutyl tin dilaurate, dibutyl tin dimaleate and tin mercaptide. These are used but the tendency nowadays is for proprietary compositions to be sold.

Group IV

The most important materials here are the epoxidized oils and esters and chelators. The former are always sold as proprietary materials and will be considered in the appropriate article and the latter are usually alkyl or aryl phosphites. There are also a number of miscellaneous products which do not appear to be very widely used. Examples include the partial esters of polyhydric alcohols such as glycerol mono-oleate sold by A. Boake, Roberts and Co. Ltd.

It is also proposed to consider the UV light absorbers in this group, mainly the substituted benzophenones.

Group V

Most of the metal soaps and salts dicussed under this group belong to Group II. The big difference, however, is that they are considered as combinations of stabilizers, not as single units. The use of synergistic mixtures is probably one of the most important developments in stabilizer technology. Some materials cannot be used alone at all but are most effective with other stabilizers.

Such systems can be made in two ways. Either the individual stabilizers can be made first and then added together to form simple mixtures or they can be co-precipitated during manufacture, resulting in much greater efficiency. Some of the types of combination referred to are as follows:

Barium/cadmium laurates, ricinoleates and stearates.
Barium/zinc stearates and laurates.
Barium / cadmium / zinc, stearates and laurates.
Strontium/zinc laurates.

Future Articles

The study of stabilizers today is a complex subject and a careful plan of approach is necessary. The present article has laid the foundation for future articles and all information will be given within the framework of the group system outlined.

The second article will deal with the important aspect of testing and comparing stabilizers. In this it is absolutely essential to consider not only the older 'static' method of testing but the 'dynamic' test carried out on the mill. More attention must also be paid to tests for UV light absorbers.

Further articles will consider in detail each straight stabilizer and then the proprietary stabilizers many of which are known mixtures and many of which are unknown mixtures.

Another article will discuss special properties of stabilizers on a comparative basis and will include: (a) Stabilizers which are specific to certain plasticizers; (b) Stabilizers which are specific to certain polymers and fillers; (c) Stabilizers which are non-toxic; (d) Stabilizers for translucent and transparent combinations; (e) Dispersion of stabilizers using dispersions and liquid types; (f) Stabilizers used to overcome plate-out, and so on.

All articles will give numerous examples of the combinations of stabilizers to be used and practical examples of their usage in specific compounds, *e.g.* rigids, injection moulding, extrusion, calendering, etc.

Conclusions

Basic lead carbonate has been the standard stabilizer for many years and is still widely used. However, with the advent of higher processing temperatures and speeds, attractively transparent and translucent products rather than utilitarian materials, highly filled pvc compounds and products used extensively out-of-doors, particularly in the tropics, it has become necessary to devise new stabilizers systems. White lead just would not do in many of the condiditions described.

As a result of intense activity over the past few years there is now a legion of stabilizers which grows daily. An attempt has therefore been made to classify the materials so that some sense can be made not only of existing materials but new products as they are adopted. If stabilizers are always thought of in this way then suppliers and users alike will maintain a reasonable balance and make development and usage quicker and easier.

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[2]L. H. Whartman, *Ibid.*, **47** (5), 1013-1019, 1955.

Part 2 of 'Stabilizers for pvc', which will appear next week, will deal with the testing and comparison of stabilizers

Cutting Mould Costs

Burnham and Co. (Onyx) Ltd., which manufactures display signs from acrylic and pvc sheet, is using Permaply, a resin impregnated plywood, for making moulds. By this means a cost saving of 63% is claimed.

The Permaply moulds are capable of withstanding the temperature changes — from 175°F.-90°F. — incurred during the forming process.

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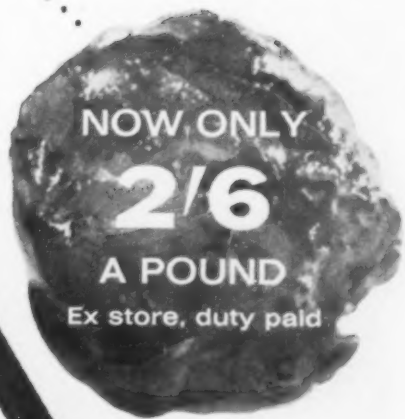
Chemicals Division, Esso Petroleum Company, Ltd, 50 Stratton St, London W1. Phone: HYDE Park 7030.



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Review of Interplas 61

RAPID PROGRESS IN PREPLASTICIZATION TECHNIQUES

THE engineering exhibits at Interplas 61, the international plastics exhibition held at Olympia, London, were most impressive. Not only were many equipment manufacturers exhibiting, but most of them had working machines on their stands.

The machines which were most obvious were the injection moulding presses of which quite a number were exhibited by companies from the UK and the Continent in particular. There were small bench models and various sizes up to the 80oz. British built HPM machine by Cravens Ltd. and a similar size machine by R. H. Windsor Ltd.

Although it cannot be said that there was anything startlingly new at the exhibition, the rapid progress of preplasticization techniques was most obvious. Whatever the feelings about this process are in the USA there is no doubt that Britain and the Continent are moving rapidly towards this technique, which undoubtedly gives a very homogeneous melt.

Injection Moulding Machines

BIP Engineering Ltd. were exhibiting machines for the first time, one of them following the general trend in the use of screw preplasticization. This new machine in the Bipel range is the 4-8oz. screw preplasticizer injection moulding machine which is capable of moulding the more difficult materials such as rigid pvc, polycarbonate and nylon. The useful feature of the new machine is that it has been designed to fit the base and locking unit of the Bipel piston machine so that conversion from one to the other is simple. In this connexion, the new 4-6oz. injection-moulding machine was on show for the first time in the UK, using the normal plunger injection unit which remains the cheaper and simpler method of moulding such materials as polystyrene, polythene and cellulose acetate.

Multi-station Machine

As in all equipment today, there is a strong movement in the injection moulding industry to speed up machines as much as possible. A revolutionary method which has achieved this was demonstrated by Turner Machinery Ltd. Both their Turnamatic and Rotomatic machines were on show. These have several moulds on a turntable so that as soon as injection has been made into one, it moves on and another one takes its place. This enables thick section mouldings such as shoe heels and screw-driver handles to be produced at high rates since a more adequate cooling period can be given. While the cooling is taking place, auxiliary operations such as stamping, sprue finishing and printing can be performed automatically.

A very wide range of machines is manufactured by the German principals of Battenfeld (England) Ltd., some of which were displayed at the exhibition. Their machines are capable of handling injection weights from 1¼oz. to 22lb., and are supplied in horizontal as well as vertical designs. Some of them are the standard piston type machines but many include screw preplasticization, frequently achieved by the addition of a screw plasticizer attachment. A typical example is the BSM, VP 10/25, a fast cycling, high plasticization performance fully automatic machine. It has an output of up to 15-18 shots per minute and a plasticizing capacity of 17.6lb. per hour. Steplessly regulated follow-up pressure ensures uniform, consistently maintained quality from beginning to end. With the addition of the screw plasticizer attachment, the shot weight can be increased and the range of the machine extended to enable it to process the difficult materials.

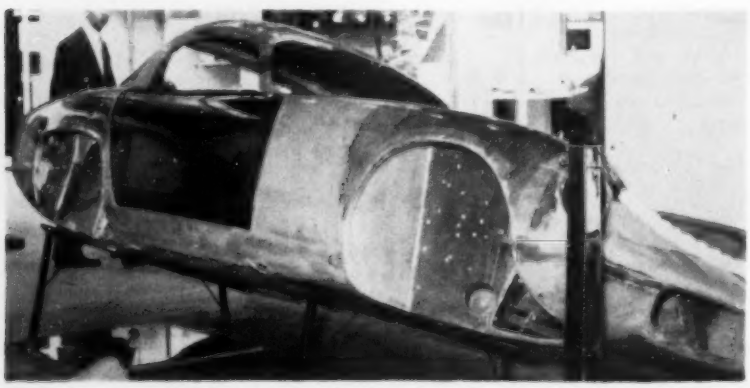
Big British Machine

Perhaps one of the highlights of the exhibition was the British-built Cravens Ltd. HPM Model 650-P-80 preplasticizer type injection moulding machine. This huge machine is capable of injecting 80oz. of polystyrene per shot, representing a volume of 141 cu. in. It has a plasticizing capacity of 200lb. per hour for polystyrene and the figure is, of course, higher for acrylics and cellulose acetate. Important features of the machine include two double acting rams working in smooth bored steel cylinders; the entire injection end is mounted as a unit on ways; in the preplasticizer, all working surfaces are chromium-plated giving considerable assistance with some difficult materials; the machines can be manually or semi-automatically controlled, and there are appropriate safety features; the plasticized material is packed in the injection chamber to an adjustable pressure which thus displaces gas, improves homogeneity and ensures uniform moulding. Bone Bros. Ltd. are associated with Cravens (Machines) Ltd. and supply a single screw pre-plasticizer unit for the conversion of conventional plunger injection moulding machines of about 8oz. capacity into the screw pre-plasticizer type of machine with increased capacity.

Foreign Companies

One of the outstanding features of the injection machine industry at the present time, which was reflected at the exhibition, is the number of companies of Continental origin.

Baker Perkins Granbull Ltd. are sale and manufacturing licensees of



Body of Elite special sports car on the Distillers Plastics Group stand, moulded from Cellobond A262 9 polyester resin

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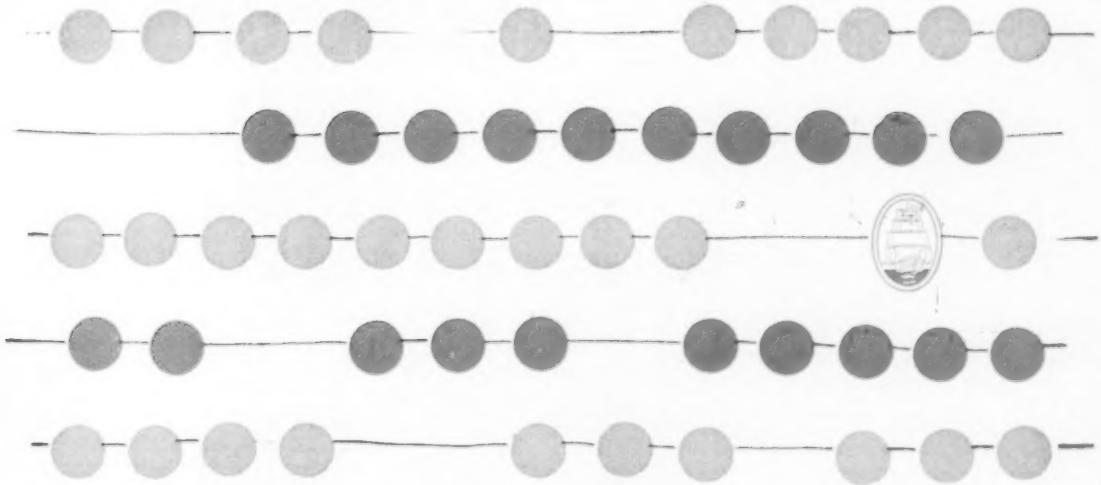

Stearic acid—a ton at a time! . . . child's play to move and handle in the form of Stearex Beads. Packed by Price's especially for the rubber industry in standard size non-returnable bags, a ton of Stearex Beads loaded on a pallet takes only seconds to offload and run into store.

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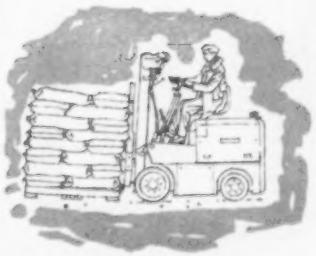
Stearex Beads have Price's name for quality and reliability behind them.



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A. Triulzi of Milan. They showed 6oz. and 10oz. screw preplasticization machines on their stand but the range includes a machine up to 425oz. capacity. The 300/40/150 machine, with a capacity of nearly 11oz., has a plasticizing capacity of 88lb. per hour, can achieve 420 shots per hour, gives a mould locking force of 165 tons, has a stroke of nearly 12in. and has installed heating power of 10.7kW.

Bühler Bros. (England) Ltd. with their Swiss principals were demonstrating their Rover 175 and 350 machines with shot capacities respectively of 9oz. and 18oz. They are soon to bring on to the market a Rover 70 with a shot capacity of 5oz. and a Rover 600 with a shot capacity of 90oz.

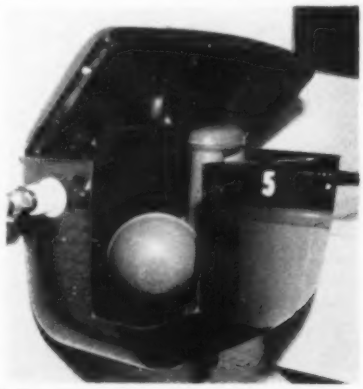
The Scandinavian countries were well represented and Bernard Jorgensen, of Copenhagen, demonstrated their Esarco 30. This has a shot capacity of 0.75oz. with a plasticizing capacity of 16lb./hour. The machine is a standard injection type press and is fully automatic in operation. Although not normally suitable for the injection moulding of pvc, a complte cylinder unit and piston (hard plated) is available for conversion of the machine to this plastic.

The Elgar Machine Tool Co. Ltd., as exclusive distributors in the UK, showed Flesch injection moulding machines available in a range of capacities from 1oz. to 64oz. Both horizontal and vertical machines are available and screw preplasticization is now quite common. The Model Ve VHS 30B has a capacity of 8-12oz. polystyrene, and is a vertical machine with a high production rate. It has a plasticizing capacity of 56lb. per hour. A more normal type machine is the VHS 5140 which gives high capacity in a small space thanks to the high plasticizing capacity given by the screw preplasticizing unit. The machine has a shot weight of 17.6oz. and a plasticizing capacity of 88lb. per hour.

Prominent in the British Celanese display: polypropylene ducting fabricated by James Coates Bros for Mather and Platt

Auxiliary Devices

Bradley and Turton (Injection) Ltd. were exhibiting two interesting developments. The first was a single screw injection unit for fitting to existing machines to convert them to screw preplasticization types. These units can be fitted not only to Bradley and Turton machines but to those of other manufacturers as well. The units are normally supplied for hydraulic working pressures up to 3,000 psi and the plasticizing capacities of the two machines are 100lb. and 250lb. respectively for the size 40 and size 125 units. The other machine of very advanced design is



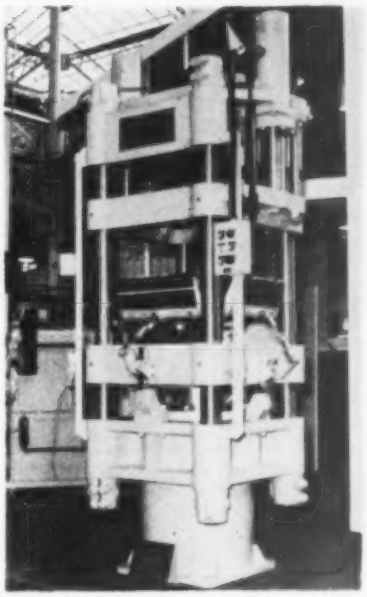
I.C.I. were showing a wide range of products applicable to the building industry, one of which was this polypropylene cistern

the 3V-40 20-24oz. vertical injection moulding machine with screw preplasticizer. This type of machine enables a large opening (daylight 2ft. 9in.) to be achieved with a limited floor space. There is 'up-shoot' injection for improved mould cooling and air expulsion but, in spite of these differences, existing moulds can readily be fitted to the machine.

Extruders

There were a number of outstanding exhibits at Interplas which showed that extrusion machinery is still advancing at a rapid pace.

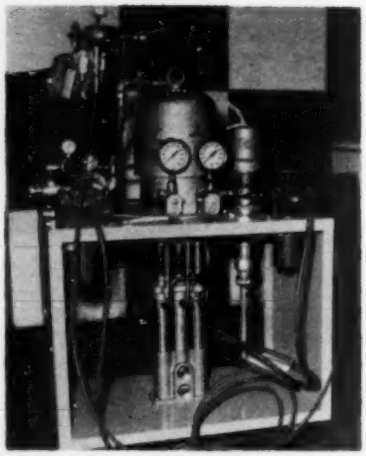
One of the outstanding British produced machines at the show was the 4½in. General Engineering Co. (Radcliffe) Ltd. extruder. This machine is of really advanced design capable of meeting the most exacting requirements of the cable industry and is capable of 120rpm with an output of 750lb. per hour. Such speeds would normally cause considerable heat development with consequent difficulties in dissipation. However, this problem has been overcome in two ways. In the first instance efficient water cooling has been installed on the barrel and secondly the extruder is valved. This means that a temperature development can readily be varied by changing the pressure in the extruder which can be read on a pressure indicator. The pressure is easily changed by means of a handle and, more important still, it can be changed while the machine is running. Water cooling is also allowed for in the screw but the valving arrangement rarely makes it necessary to water cool this component. L/D ratio is only 15:1 but this is adequate for all materials, again because of the valving arrangement. Induction heating is employed, the gaps being covered. A machine of this type is capable of working in a production line consisting of wire drawing equipment, etc., up to speeds of 14,500ft. per minute.



Francis Shaw featured this automatic battery box press, which produces two 12-volt battery boxes in ebonite every 15min.

Extruder Mixer

Another very interesting machine was the Mapré twin screw plastics extruder which can also be used as a mixer/extruder. K. W. Chemicals Ltd. are the sole concessionaires for this machine in the UK which is receiving wide acclaim. The machine has two screws of 160mm. diameter although smaller machines are also made. The standard screws have a compression ration of 1:2 and are claimed to be suitable for plasticized and rigid pvc, polystyrene, polycarbonate, cellulose acetate, nylon, and high density polythene. The output



'Hydra Cat' machine on the Baxenden Chemical Co. Ltd. stand, for the airless atomization of polyurathane, etc.

of polythene is 1,100 to 1,320lb. per hour, but is considerably more in the case of pvc, and figures up to one ton may be possible.

British Extruders

Francis Shaw were exhibiting several of their well-known machines, the most interesting of which, perhaps, was the P.4½in. extruder for the extrusion of high impact polystyrene, polythene sheeting or polythene blown film, apart from more standard materials. For sheeting, the screw has a L/D ratio of 20:1 and for blown film of 18:1. There is provision for water cooling and the screw is easily detachable from the driving head for maintenance purposes. Axial blowers are provided for cooling the barrel for automatic and hand control, and when on automatic they cut out as the heaters are switched on, maintaining accurate temperature control.

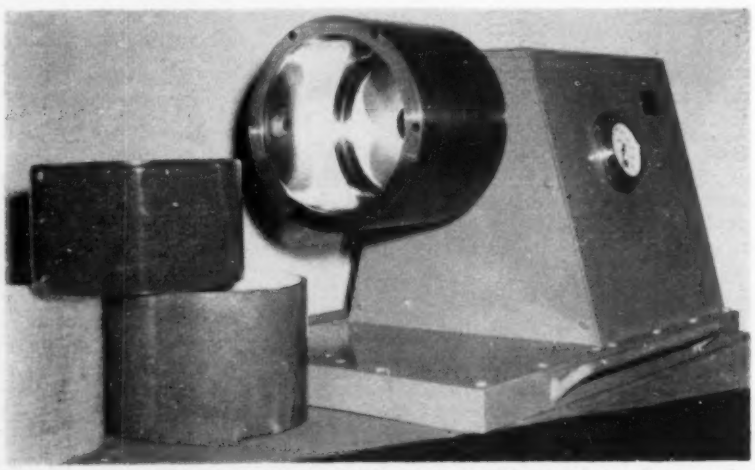
A Peco 25 extruder displayed has a capacity of 100lb. per hour for polythene, and a length/diameter ratio of 17:1 for the standard screw of 2½in. diameter. Water cooling channels are provided in the cylinder feed section and automatic water cooling is provided on all zones.

Other Machines

Apart from their injection moulding machines, Battenfeld also manufacture a range of extruders. These have screw diameters ranging from 0.98in. up to 7.08in. (models BE20 and BE150 respectively) and the L/D ratios are 20:1 for the smaller machines and 24:1 for the larger machines. On Model BE20, the screw speed is 8-88rpm which gets less with increasing size down to 6-38rpm for the BE150 model. The number of heating zones increases with increasing size of machine and the extruder cylinder has five of these on the largest machine. The machines can, of course, be fitted with blow heads, cross-heads, etc.

Bone Bros. Ltd. showed machines made under a licence from their American associates F. W. Egan and Co. These machines are made in sizes ranging from ¾in. up to 8in. One of the most interesting features of these machines is the Willert patent temperature control system consisting of a jacket containing fluid fitted around the extruder barrel in zones. There is a condenser assembly and when the barrel is heated, vapour under pressure rises into the condenser chamber. The machines also have all modern features including L/D ratios up to 24:1.

Dicing machines may be used in conjunction with extruders and one of new design was exhibited by Industrial Plastics Ltd. This was based on a French machine but is now manufactured in Britain in an improved form. The machines can handle such difficult materials as high impact pvc, hard nylon, etc., and give cubes which can be varied in size down to the smallest sizes which are becoming increasingly popular today. The range will comprise dicers with outputs varying from 1-4 tons per hour.



Laboratory centrifugal casting machine together with sample castings on the International Corporation Ltd. stand

Vacuum Forming

Elgar Machine Tool Co. Ltd. showed Illig vacuum forming machines, of which they are the UK distributors. These include eight standard models with sheet sizes from 24in. x 20in. to 80in. x 40in. They can be heated from one or two sides, and are equipped for manual or fully automatic operation. Quite a number of different techniques of vacuum forming including positive, negative, positive with pneumatic pre-stretching, with plug assistance, etc., may be carried out on this machine. Special purpose machines are made for the more difficult jobs including the covering of furniture and travel goods and there are special high speed, fully automatic machines for the production of trays, thin wall containers and bubble packs.

Interwood Ltd. were exhibiting their twin vacuum shaping and veneering press. The important feature of this machine is the continuous working. While vacuum is being applied to the article concerned on one side, the curing cycle is taking place by the use of the electrically-heated dome on the other side. When the cure is finished, the dome is moved to the first side and so the cycle continues. The machine is normally employed for applying veneers to various materials.

Coating and Dipping

Something new that was featured by General Engineering Co. (Radcliffe) Ltd., was wire enamelling equipment by the Mitchigan Oven Co. of Detroit. The equipment manufactured by this company includes a complete line for coating wires ranging in size from 0.0006in. diameter up to large round and rectangular bars. The essentials in such a line are the bare wire pay-off stands, including a self extinguishing device; a wire pre-annealing oven with inert atmosphere; the applicator for the enamel; the ovens, all operating on the high velocity re-circulation principle; sheaves and capstan units with mechanical or electronic speed variations as required.

Casting Machinery

Rotational casting equipment was demonstrated by London and Scandinavian Metallurgical Co. Ltd. The Loska Rotational Moulding Equipment Series 1 has been designed for

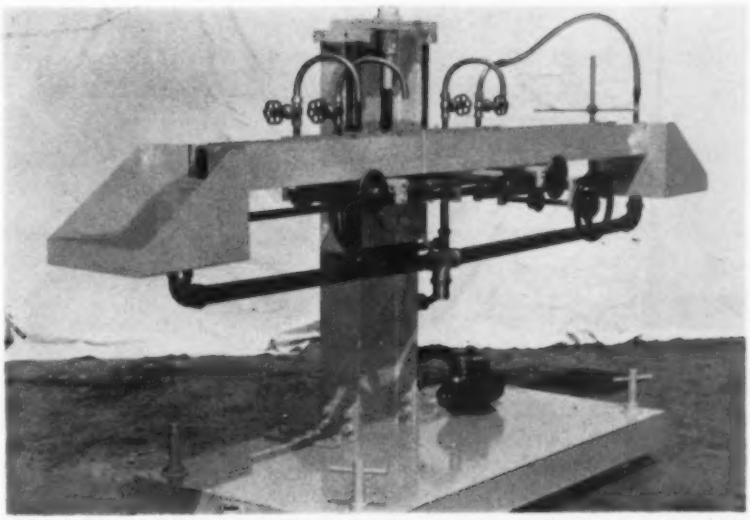
the efficient production of hollow pvc articles. Seven items form the complete equipment including oven heating and control panel, adjustor unit, cooling unit, centrifugal unit, vacuum extraction unit, conveyor table and mould carriers.

Compression Moulding

In addition to other equipment, Battenfeld were showing their compression presses for the processing of most rubber and plastic materials. Fully automatic presses available include their automatic serial press with four 2 ton pressing units. This machine automatically weighs the material, delivers it to the mould and ejects. Their range of presses, which includes transfer types, give rapid no load forward strokes and smooth application of pressure to the objects concerned. Their fully-automatic multi press BRP 4/2 is particularly suitable for the economic production of small and medium sizes of threaded mouldings, particularly bottle screw caps.

Blow Moulding

Although injection and extrusion machines held pride of place at the exhibition, there is no doubt that the blow moulding machines attracted considerable attention. The Peco Euromatic blow moulding machine is the result of production experience over a number of years and permits ten different automatic sequences so that the containers when ejected from the machine require no other machining operations. One, two or three mould production can be obtained, although in special cases this can be increased to five. Any make of extruder can be used in conjunction with the blow moulding machine and throughputs of between 8lb. and 90lb. per hour may be required. Sizes of extruder recommended are between 1½in. and 2½in. and screw diameters with a L/D ratio of between 16:1 and 20:1. Some examples of the output of this machine include 1,100 units per hour of 4gm. each down to 130 per hour of 125gm. each, the latter having capacities up to 3 litres. The output of the machine can be increased considerably by double mould or treble mould production.



Amongst the machines on the Brown Davidson stand was this water bath, which is free moving in horizontal and vertical planes

Matthew Wylie and Co. Ltd. had a good display on its stand of the Fischer Blow Moulding Machines. These are normally sold as a unit with the extruder and blow moulding component but the blow moulding unit can be supplied separately if required for addition to any extruder. Machines are available which can produce hollow articles from 50cc. (BM50/5000ccm.) up to 350 litres (BM50M350 LTR).

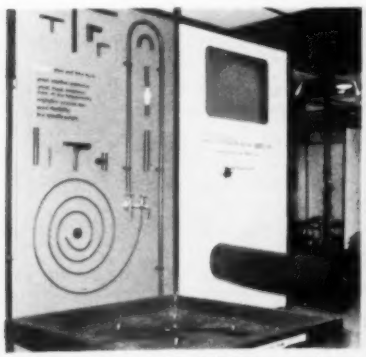
Brown, Davidson and Co. Ltd. exhibited a rapid semi-automatic blow moulding machine. The combined extruder has a 2in. diameter screw, screw speeds ranging from 25 to 140 rpm, the plasticizing capacity being 50-55lb. per hour. The capacity of the blow moulder is up to 1,000cc. or 40oz., single or twin moulds can be used and 100 per hour of the largest size container can be produced, this being increased to 400 per hour for a 15cc. size object.

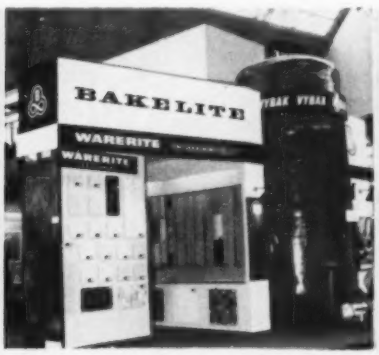
Fabrication from Sheet

Some useful ancillary equipment for fabrication from sheet was a feature of several stands. Included among this was an electric welding torch by Associated Electrical Industries Ltd. A number of thermoplastics can be fabricated by using the heated gas jet from this torch, which required a gas flow of 30-50cu. ft. per hour of inert gas. The temperature of the jet can be varied from 250-400°C.

Bone Bros. Ltd. were exhibiting their interesting Roto-Poly 200 polythene bag making machine. This is manufactured in England under licence from Conopac Corp of the USA. This machine can produce up to 300 bags per minute with a minimum face width of 3in. and a maximum face width of 16in. The standard equipment includes static eliminators, counters and a perforator.

Continued on page 25





(*Left*) **Part of the AKU display—pipes and a lawn sprinkler in Stamylon polythene.** (*Centre*) **Dominating the Bakelite stand was a chemical road tanker fabricated by Tough Plastics Ltd. from Vybak pvc sheet and polyester glass.** (*Right*) **Foambacks were displayed for the first time at a UK plastics exhibition: pictured is part of the Lintafoam display**

VIEWS and REVIEWS

Product Ideas — New and Odd

THIS week I shall review a number of product ideas — new and odd — which have recently appeared in technical polymer literature.

1. If you want something to stop a 30-calibre bullet, then make a ¾in. sheet of a 'thermosetting epoxy/polyamide formulation combined with pvc' and laminated with glass cloth. Even when not reinforced, a bar of it can be driven without much impairing of the point, through a metal sheet. It may yet be used for car bodies, tank linings, and shoe soles. (*I/EC*, May 1961, Vol. 53, No. 15, p. 17A.)

2. 'A difunctional monomer combines with the hydroxyl groups of cellulose and so gives to cotton and rayon garments wash-and-wear qualities which last the life of the garment', and are better than current resin treatments. (*Ibid.*)

3. An inflatable dam in a Hawaii reservoir increases the storage capacity by 500m. gallons but automatically deflates to prevent flooding during the rainy season. It is made of a nylon fabric coated with neoprene and its 'life expectancy' is 15 years. (*Rubber Age*, May 1961, Vol. 89, No. 2, p. 329.)

4. A mould for sculpture can be made of 'polysulphide rubber' cold-set on the clay model. Claims for it are that it is easier to manipulate than plaster and gives a more faithful reproduction of intricate details. (*Adhesives Age*, March 1961, Vol. 4, No. 3, p. 37.)

Stinks

5. It was Dr Johnson who corrected his landlady thus: 'No, madam, it is you who smell; I stink'. In as much as he compiled the first English dictionary, that dictum may be taken as authoritative, but since his day the word has fallen into disrepute, and is mainly used in schoolboy literature as an affectionate diminutive for chemistry.

A good and apparently well-documented story about the importance of the odour of things appears in the paper, 'On the Possibilities for Perfuming Pvc Products', by Dr H. Schnabel and Dr F. Böhme in *Plaste und Kautschuk* for April 1961, Vol. 8, No. 4, pp. 213-4. They quote a piece of research by Obrocki in 1956 'with two pairs of identical stockings of which one pair was lightly perfumed. A large number of women were asked to try these and to select the pair they preferred. They were also asked to answer a questionnaire about the reasons for their choice. Over 80% voted in favour of pair No. 2, giving as reasons that they lasted longer, looked of better shape or colour. The only difference, which was the perfuming, was not mentioned'.

The authors point out that perfuming of commercial products has been used widely for certain types of goods and particularly to mask an undesirable smell. Among other examples, they site the use of a 'smell corrector' for Moltopren foam rubber in which the odour of residual amine activator can be unpleasant, and, in the USA, of polythene film intended for packaging sweets and therefore being perfumed with peppermint or chocolate.

They think, however, that the odour of plastics articles, especially plasticized pvc, has been overlooked in the efforts, by means of texture, colour, and so on, to make an attractive article.

Re-odourizing Pvc

Pvc is a special material from this point of view because it is used in so many domestic articles and often has odorous compounding ingredients incorporated.

The article lists ten perfumes (and their manufacturers) suitable for re-odourizing plasticized pvc, and available in (East) Germany. They have proved successful in trials using emulsion-polymerized pvc, which contains residual emulsifiers and sodium bicarbonate, and using DOP as the plasticizer.

In order to secure uniformity in distribution, the perfume was first dissolved in the plasticizer.

Large differences were found between the ten re-odorants, arising chiefly from chemical composition and volatility during processing, and they differed in permanence in the finished article.

6. Now we are to have tasty toothbrushes. 'The plastics handles are coloured and scented to give the impression of chocolate, vanilla, orange, lemon, lime or strawberry flavours. . . . Coloured caps of the brush packages are scented to match the brush'. (*Adhesives Age*, March 1961, Vol. 4, No. 3, p. 66.)

Arising from this I offer an idea of my own for evading the Excise man by making swizzle-sticks flavoured with, say, gin and tonic, or Scotch and dry ginger, for stirring into a glass of water.

Structural Ideas

7. More practical — if only because it has been done and is in constant use — is the use of neoprene as a decking. On the Rhine at Köln is the MS *Europa*, a 700-ton passenger vessel, constructed principally of aluminium and therefore for its size one of the lightest river boats in service. Aluminium posed a problem, however, to get an adherent decking material. Ultimately, a mix of neoprene latex with long asbestos fibres, was found to be suitable. Green in colour, applied with a trowel to give a smooth surface with no joints, it is, of course, highly resistant to weather, chemicals, oils, and greases, and the decks are expected to last as long as the vessel is in service, some 20 years or more.

8. The choice of neoprene for this job was, technically, fairly obvious and there were considerable savings in the cost of installation, but the polymer technologist and the salesman will look with great interest on the choice of Hypalon flooring for the Council Room at Church House, Westminster. The economics of the decision seem to have been based on the expected life of the flooring — as long as the building itself.

Maintaining the flooring in good condition may also prove to be cheaper than with some other flooring materials. Hypalon has outstanding resistance to abrasion, will not burn and is not damaged by cigarette ends, and can be coloured to any tint or shade. It is extremely resistant to chemicals and oils, and even direct sunlight. One of its biggest attractions for flooring is its recovery

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **F. C. JENNINGS**

from indentation, even after being subjected to the pressure of heavy library tables.

Elastomers in Hospitals

9. Anyone interested in prestige publicity for our industry should find a rich field in our contribution to the medical and surgical work of the hospitals.

The latest contribution arises from an extensive study of operating theatre requirements by a British firm, New Electronic Products Ltd. A new concept of theatre design has been evolved.

Independent of the main building, the theatre can be fabricated in standard units. The structure is octagonal in plan and its wall and ceiling panels are made from a cellular polystyrene core faced with aluminium and coated with Hypalon. The panels are sealed to the framework and to each other by a system of corner strips and extruded gaskets coated with Hypalon, and there are seals for the door, windows, roof, and hatches made from a 'three-way blend of neoprene, Hypalon and SBR'.

The use of interlocking panels and self-sealing gaskets not only cuts down installation costs and allows changes to be made easily but means that the dominant and most exacting requirement of an operating theatre can be met — ease of sterilization.

Real Compounds

10. There are processes in our industry where rubber is used not for its inertness towards other chemical agents but for the opposite reason. They are those in which rubber is used as one of the materials in a chemical reaction, and are therefore of peculiar interest to the chemist, who can frequently be heard complaining that these are the only true compounds of rubber.

I was recently shown the manufacture of Pliofilm rubber hydrochloride, at the Goodyear factory in Wolverhampton, by J. Denson (fresh from delivering this year's IRI Foundation Lecture at Birmingham) and R. Fox.

The starting material is a specially selected, fine grade of natural rubber from Ceylon, and from that point, through the hydrochlorination, film-casting, drying, solvent recovery, to the testing and packing of the product, the outstanding impressions were of care, cleanliness, and simplicity (when you know how!).

Their elegant method for measuring the clarity of Pliofilm underlines the need for cleanliness in the process and care in selecting and controlling the natural, raw material.

11. In order to make a true rubber compound, it is not essential to start with a natural rubber, any more than in order to make one of those plastic mixes often erroneously called 'compounds'.

For instance, US Patent No. 2,943,988 of Phillips Petroleum Co., describes a process for the production of a rubbery, chlorinated polymer compound by reacting elemental chlorine with a polybutadiene.

Fibres and Threads

12. Under the trade name, Vyrene, Dunlop is launching a new elastic yarn this autumn. It is a linear polyurethane monofilament, silicone-lubricated. Owned jointly by the Dunlop Rubber Co. and the US Rubber Co., it will be produced in the Hirwaun, South Wales factory of Dunlops.

At present, it is being imported from the USA and used in British garments, such as swimwear and foundation garments, but it has a future in other garments from men's suitings to the finest laces and lingerie materials.

Chronophages

The etymologically-minded will recognize this word as deriving from chronos=time, and phage=to eat. Time-eaters.

I had intended to finish this collection of new ideas with a review of two papers on non-woven textiles, but that must wait because a word or two is desirable on the killing of good ideas.

I know from my postbag that there is considerable interest among the readers of this journal about the wider aspects and implications of daily work. Scientists, technologists, 'productionists', managers, directors, secretaries, all now have a common problem or complex of problems. Where am I getting? How can I get there quicker?

We are in a time of great and rapid technological change and it is not easy for the human mind to adapt itself quickly enough. The young have the great advantage that they do not have to unlearn; the old, in modern industry, can less and less claim 'experience' to be valuable.

We are provided with many gadgets and gimmicks to enable us to do our work more quickly and, ergo, to do more of it. But it is not all gain, it carries the seed of its own destruction. That seed is Interruption.

The Art of Working

In his excellent little book, 'The Art of Living', issued last year as a Penguin, Andre Maurois has a chapter on 'The Art of Working' in which he says: 'The effectiveness of work increases according to a geometric progression if there are no interruptions. . . . Desultory work always shows the effects of interruptions'.

Success in business depends mainly on first choosing the right objective and then in pursuing it single-mindedly. 'Do what you do' even if it means, as it will, discipline in work.

'Keep clear of time-wasters, or as Montherlant calls them, chronophages. They are pitiless, and from the man who does not resist them they will take the last moment of his time without considering that if left alone he might do valuable work. They are unscrupulous. . . . Chronophages function by visit, telephone, and letter. Towards them kindness and patience are grave faults. They must be treated ruthlessly; it would be suicide to make friends with them'.

It might be that, if we had the time (but we have not), a new morality of business might be evolved in which chronography would be a vice or a sin, and we should hesitate to interrupt a man at his work. As it is we have to take steps to protect ourselves; we erect barriers such as telephone-answerers, we plan and follow strict time schedules. These are good and legitimate, providing we do not use them to shirk some of the human duties which business organization demands of us.

It is sometimes necessary to break people of the habit of interrupting because, to quote Maurois again, 'He who allows himself to be devoured will be devoured, and he will die before he has done his work'.

CHARLES JENNINGS

MEN and MATTERS

A Review of People and Events

by Peter Richards

READERS will remember the very successful industrial conference held by the Institution of the Rubber Industry in Southport in the autumn of 1959. A similar conference has now been arranged for 1962: it will take place at Leamington Spa from November 16-17 1962. The subject will be 'The Background to Management Decision — Britain in the early 1960s'.

Four authorities will discuss important factors that have to be considered by management, in the economic, scientific and social fields, and a fifth speaker will discuss the impact of these factors on an organization in the rubber industry itself.

A good feature of the conference is that it will divide into working parties to debate individual contributions, which will report their conclusions back to the main conference.

Design Names

The number of names in design being attracted to plastics is an indication that the field is becoming more and more design conscious.

Recently Adrian Duckworth was appointed consultant to Vitesta Ltd., the plastics offshoot of Vitafoam Ltd., and now Mrs Phoebe De Syllas has been appointed consultant to the decorative laminate division of Harrison and Sons Ltd.

Mrs De Syllas, who was trained at the Slade and Central School of Art, has been increasingly well known as an interior designer in her own right since the war. She was consultant interior designer to the LCC welfare department and for three years ran the design office of Dunns of Bromley. Recently she has completed the interior of a new hospital at Poole for Wessex Regional Hospital Board.

Mrs De Syllas has been responsible for the colourways for the new range of contemporary plastics patterns which have been developed by Harrison's.

Incidentally, this week Adrian Duckworth was appointed a director of Vitesta Ltd.

United Carbon Apointment

Dewey D. Billodeau has been appointed plant manager of United Carbon's new $5m. carbon black plant in Port Jerome, near Le Havre in northern France.

The plant will be operated by the company's new subsidiary, United Carbon France, S.A., under the direction of George Webster, president and general manager. The plant will be fully operational late this summer with initial production scheduled for early this summer. It will have an initial rated capacity of 50m. lb. of carbon black a year.

Screen Control

The early days of TV saw many odd things on the screen — although some critics would say we now see odder. However, technical breakdowns are now few and far between, thanks to a complicated control procedure.

Recently, Associated Television Ltd. installed a 12ft. long production control desk at its Elstree studios. Here, the intricate controls of a programme are supervised by a team of experts including the producer and vision mixer.

A feature of the desk, which was tailor-made to exact requirements, is surfaced in a Warerite decorative laminate.

Geigy Directors

The companies of the Geigy group have elected additional directors, who take up their appointments today (July 1). Elected to the Geigy Co. Ltd. are: L. R. Dowsett, A. Hill, T. W. Parton and J. Smethurst; to the Ashburton Chemical Works Ltd.: K. M. Townsend and B. J. Warr; and to James Anderson and Co. (Colours) Ltd.: T. Gibson and K. G. Hargreaves.

A. HILL

L. DOWSETT

Viscount Rochdale, who is a member of the board of Geigy Holdings Ltd., has succeeded A. H. Whitaker as chairman of James Anderson and Co. (Colours) Ltd. Dr F. Buchmeier has been appointed deputy chairman of the company.

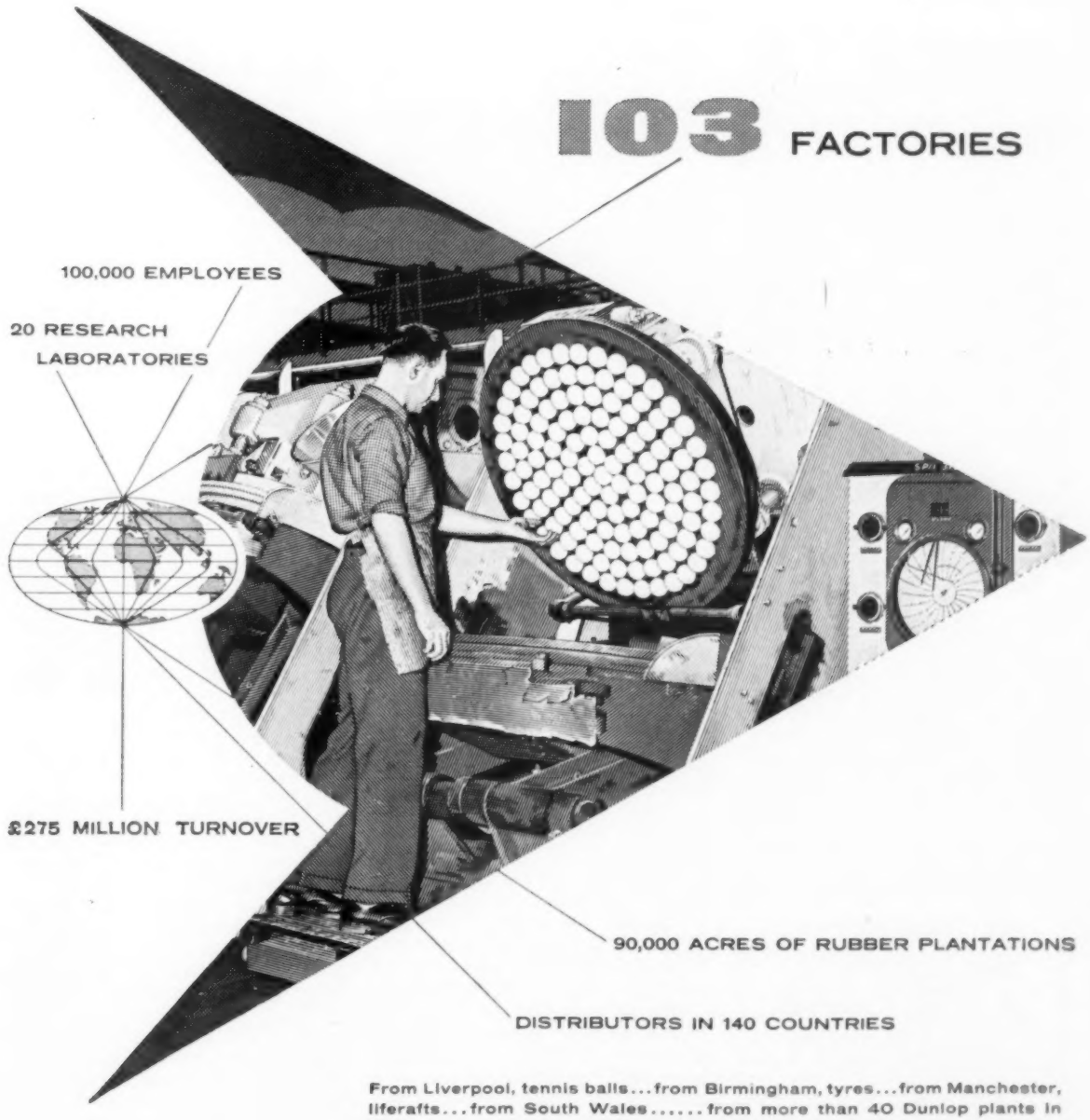
Shanks' Pony Mechanized

San Diego, California, USA, has become a city of moving pavements. It now has six of these step-saving devices, more than any other metropolis in the world. Newest additions are twin units that carry shoppers from a mammoth underground parking area to the shopping level of a huge 'market place' in northern San Diego. The units carry 7,200 people an hour.

There is a built-in safety factor, a 'floating comb' that runs between closely-spaced ribs of a special belt

The Minister of Science, Lord Hailsham, showing keen interest in a 'plastics special' on the Distillers Plastics Group stand at the Interplas international plastics exhibition. Explaining a point is the Group's deputy chairman, P. A. Delafield

BEHIND THE DUNLOP SYMBOL



From Liverpool, tennis balls... from Birmingham, tyres... from Manchester, liferafts... from South Wales..... from more than 40 Dunlop plants in Britain come a vast range of consumer and industrial goods. And in a dozen overseas countries the Company's new symbol identifies equally diversified and continually expanding manufacturing activities.

Only last year new factories in France, India and Rhodesia went into production, and plans were advanced for a second tyre factory in Japan. These resources and developments behind the Dunlop symbol are reflected in the progress of motoring, aviation, mining and countless other industries —and in the greater comfort and convenience we all enjoy in our daily lives.

DUNLOP SYMBOL OF PROGRESS

CFH/PRS/54

produced by The Goodyear Tyre and Rubber Co. to prevent trapping of high heels or clothing at the ramp exit. A companion micro-switch assembly halts the belt and applies a dynamic brake if even a small object slips under the comb.

This picture was not taken in my back garden, but in the front of a stand at the Interplas plastics exhibition: polythene flowers made in Portugal by Luso Sintetica Ltd.

From Geneva to Brussels

Samuel Turover, manager of European marketing research for Monsanto Chemical Co.'s overseas division at Geneva, Switzerland, has been appointed sales manager of Monsanto Belgium S.A. at Brussels.

The Belgian company is a subsidiary of Monsanto of St. Louis, Mo., USA. It was formed in 1960 in partnership with Société Industrielle de la Cellulose (SIDAC) of Brussels to produce Monsanto's Saflex polyvinyl butyral sheet used in laminated safety glass.

Mr Turover has served in Paris, France, and Geneva for Monsanto since 1953 in a sales supervisory capacity and later as a marketing research specialist. He joined the company's overseas division at Springfield, Mass., in 1951, before being assigned to Paris in 1953.

Appointments in Brief

K. M. Johnson of Wallington Weston and Co. (a part of the Marley Group), has joined Rubber Improvement Ltd. as general manager of the Wellingborough unit.

* * *

H. R. Brooker has joined the board of Johnson, Matthey and Co. Ltd., as a joint managing director. He was previously general sales manager, and will continue to be principally responsible for all the sales divisions of the company.

* * *

BTR Industries Ltd. has appointed W. G. B. Mills deputy manager of the group's thermoplastics research and development laboratory at Silvertown, London. He was previously technical director of Dohm Ltd.

Polly Ester Says...

'Blow moulding—and down with extrusion, too'

THE LEGAL ANGLE

A Matter of Skylarking

By a Barrister

'Whereas in 1959 *there were* 570,000 *school-leavers, this year it is estimated that there will be close on* 700,000. *Expanding industries like the polymer industry can certainly absorb the extra talent that will be available'. — RPW* May 27 1961.

More school-leavers in the industry? More youngsters to tend the machines, make the tea, run the errands, help in the canteen — and get up to mischief? Then here is another new worry for you; for just as you must take special care for the safety of young visitors on your premises, so you must expect that youngsters who work for you will need extra care and supervision.

This lesson was learned, not long ago, by a company specializing in pvc leathercloth. It employed two boys on the staff to do general maintenance work. Amongst their duties was the tending of a furnace in the basement.

One chilly morning one of the boys decided to have a bit of fun. He took a wooden broomstick — which had been used from time to time as a poker — shoved it into the coals and watched it catch light. Then, when his mate came into the room, he waved the fiery brand at his feet, making him 'jump for it'. The result? The boy's clothing caught fire, he blazed like a torch, and suffered severe burns.

In due course, the injured boy — suing through his father, as his 'next friend' — sued the company. 'I was injured', he said, 'because of the negligence of my fellow servant, in the course of his employment. You, the employer, are responsible'.

'Nonsense', countered the company. 'The boy who did the damage was skylarking. He was not employed to play around. Indeed, he had been forbidden to do so on a previous occasion. So, while we are extremely sorry about the injury, we are not responsible'.

'It is admitted that the boy was skylarking', came the reply, 'but that skylarking was itself done in the course of the boy's employment'.

And what was the result?

The company was held liable. 'The test', said the Court, 'is whether or not the boy was doing something for which he was employed — albeit in a thoroughly mischievous way. If he was, then the wrongful act was performed within the scope of the employment — and the employer is vicariously liable for it. But if it was not, and amounted to 'an independent frolic' on the part of the employee, then the employer is in the clear'.

As the boys were employed to tend — and hence, to stoke — the fire, the Court decided that the injury was caused by the negligent skylarker, doing something for which he was employed. The fact that he was doing it contrary to orders and in a thoroughly improper way, was neither here nor there from the viewpoint of the employer's responsibility.

So it cost the employer — or, rather, his insurance company — a considerable sum. And he learned that you must take very great care to protect youthful employees not only from ordinary dangers, but from the results of their own youthful stupidity.

REVIEW OF INTERPLAS 61

Continued from page 19

Raw Materials and Products

The stands of the big raw material manufacturers were, as usual, a dominating feature of Interplas. These were described in the *RPW* preview of the exhibition (June 17). Possibly the most original display was that of I.C.I., which expressed the future of plastics in building. The stand had obviously been planned very carefully, bearing in mind that, although Interplas is essentially a trade fair, it attracts a great many members of the general public.

Domestic fittings on the stand included the first cistern moulded in polypropylene, an acrylic bath and sink unit, a washing machine with covers and lid moulded in polypropylene and pvc wall coverings and upholstery material.

The architect and builder could also see much of interest in rainwater goods in pvc, hot air ducting with polyurethane foam insulation, pvc covered window frames and fume extraction equipment in polypropylene. A glimpse of the future was provided by models of buildings with stressed skin roofs.

Refrigerator Interior

Although current reports show a build-up of stocks of refrigerators, the stands of companies such as Saro Products Ltd., Ekco Ltd. and Halex Ltd., bore witness to the fact that the refrigeration industry is a large consumer of plastics. (It used 12,000 tons in 1959.) Typical of the kind of product in this field was a complete refrigerator interior injection moulded in polystyrene by Aeroplastics Ltd.

The design of this interior illustrated the advantages of injection moulding. Holes, slots and similar details were moulded in, avoiding subsequent operations, and sectional changes incorporated to strengthen the component where required. The interior was designed to a specification requiring a maximum weight of 4lb. and certain sections to be .140in. thick. To meet the specification the wall thickness of some sections were as thin as .07in. These sections were successfully moulded by the ingenious use of shelf supports and corner sections as runners, coupled with the use of a high-pressure injection unit manufactured by Fairey Engineering Ltd. at Stockport.

Blow Moulders in Evidence

Blow moulders were very much in evidence, and several stands — such as that of Cascelloid Ltd. — showed the dominating position attained in the packaging field by blow-moulded bottles and squeezable and 'roll-on' tubes, mainly in low density polythene.

A new disposable, resealable blow-moulded polythene bottle at a very low cost was introduced by Lacrinoid Products Ltd.

This has a wide neck opening for easy filling, and can be fed into a special heat-sealing machine which can close over 400 bottles per hour. The tip of the pourer spout can be cut off by the user and resealed with a captive cap. As the one pint size can be supplied (in large quantities) at not more than 3d. each, and will make important savings on freight and cost of outers, it is hardly surprising that this development created much interest.

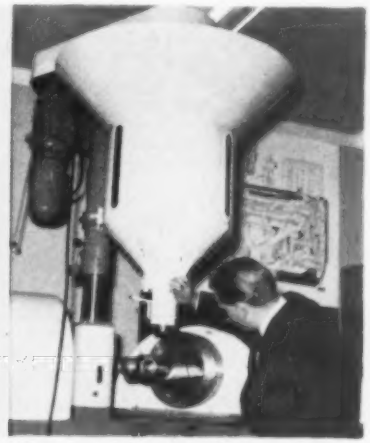
In the field of prepackaging the high gloss and clarity of polythene film was illustrated by a number of suppliers. A novel demonstration took place on the US Industrial Chemicals Co. stand — copies of each day's *New York Times International Edition* were wrapped in skin-tight polythene film made from Petrothene resin.

Dip Coating

A fairly new development is the dip coating of metals by the fluidized bed dipping technique, and this was demonstrated by exhibitors including Dohm Ltd. and Telcon Plastics.

The technique involves passing heated articles through a tank containing the powder (particle size between 50 and 100 BS mesh) which is 'fluidized' by means of compressed air forced through a porous mattress in the base of the tank. The powder behaves like a liquid and adheres to the metal.

Telcon's interesting range included cellulose acetate butyrate and epoxide resin powders.



A Mapre 160mm. (6¼in.) twin-screen extruder, used for both compounding and section and tube extrusion, was featured on the K. W. Chemicals stand. *(Left)* **Extruder head and** *(right)* **forced feed hopper and twin screw**

Rubber for Fuel Systems

ADDITIONS to the range of products made by Hall and Hall Ltd., Hampton, Middlesex, are Fluorosilicone and Viton rubbers in the form of mouldings, sheetings and extrusions. Between them these two materials cater for a wide range of applications as sealing compounds in aircraft and other fuel systems.

The Fluorosilicone rubbers fill an important gap in the range of rubbers for use in aircraft. They combine fuel, oil and grease resistance with good low temperature properties. The temperature range for continuous service is −65° to +150°C., and for short duration temperatures up to 200°C. are practicable.

Viton compounds find many applications in fuel systems and engine locations. Their resistance to fuels, oils and greases is far superior to that of conventional fuel resisting rubbers, and is coupled with increased resistance to high temperatures. They can operate for prolonged periods at temperatures up to 200°C. and often have an acceptable life even above 300°C. but are not suitable for dynamic applications at extremely low temperatures.

Heating Cables

The Panelec Heating Division of BICC, 83/86 Saffron Hill, London, E.C.1, has introduced a range of butyl rubber insulated heating cables designed for automatic de-icing and as an aid to snow clearing in roads, aircraft runways and similar locations.

Plantation Newsletter

MORE TIME FOR DECLARATION

FROM KUALA LUMPUR

RUBBER exporters in Malaya have welcomed the decision by the Customs Department to allow them more time to declare their goods before shipment. From today (July 1) they will have six working days to make declarations instead of the present two.

Special arrangements have also been made for export rubber to be declared, checked and taxed if a ship arrives late in the evening and has to leave before the Customs office opens next morning.

The new system has been drawn up to meet criticism of inconvenience caused by the present restricted period.

Duty, however, will not be received until the vessel has arrived in port, her arrival has been reported to Customs and her port clearance from her last port of call delivered to them.

Nor will a port clearance be granted to a vessel until duty has been paid on all rubber loaded into the ship.

Exporters here describe the new system as 'reasonable'. Typical reaction came from a large exporter who said the new system would ease a lot of the worry and inconvenience caused by the present system.

'For some time we have been asking for more time in which to declare our export rubber. Now, at last, the Customs Department has understood our difficulties', he added.

Winning the Hard Core

The Rubber Industry (Replanting) Board last year paid $34.5m. to help smallholders replant a total of 76,383 acres — 74,679 with rubber and the rest with other crops. It is estimated that a similar acreage will be replanted this year.

There has been a steady increase in the replanting of smallholdings since 1958 when the Malayan Government launched a widespread campaign to win over the 'hard core' of reluctant planters who shied away from replanting.

In the seven years from 1953 when the replanting board was established, a total of 404,216 acres of smallholdings have been replanted — 372,725 with rubber. Grants by the board to help smallholders to replant have amounted to $148.5m.

Last year a total of 6,826 acres of jungle land were opened up for new planting by smallholders as compared with 3,743 acres in 1959. This year the board has received 29,644 applications from smallholders to replant. Of these, 28,835 were for replanting 137,816 acres with rubber.

During the past seven years, the board has distributed to smallholders 43,499,362 clonal stumps, 1,613,490yd. of budwood, 92,415 tons of fertilizer, 72,691lb. of 'cover crop' seeds, and other materials for replanting.

Meanwhile, the Government has introduced amendments to the Rubber Industry (Replanting) Fund Ordnance to enable it to appoint five smallholders on the Rubber Industry Replanting Board.

by our Malayan Correspondent

The House of Representatives was told that in the past the Council of Rubber Smallholders Associations had not been effective and was not fully representative of all smallholders in the Federation of Malaya.

The Government said that the various smallholders' organizations would be consulted before their representatives were chosen.

Another reason for the amendment was in order to allow the Rubber Industry Replanting Board to invest funds in Government securities or place deposits, not exceeding $8m., with any duly licensed bank.

To Cure the Jitters

World rubber markets need a positive announcement to cure the present 'jitters' and allow the trade to assess the overall picture clearly, according to a leading rubber trade firm in Singapore.

In a review of the present stockpile disposal problems, the firm notes that stockpile sales have fallen sharply this year and the advent of the new 'natural-type' synthetics may make future disposal even more difficult.

The review also discusses the alternatives open to the US stockpile authorities. It says: 'Reported US stockpile sales from October 1959, when they commenced their nine-year programme to dispose of 470,000 tons, to May 1961, total 109,409 tons — almost a quarter of the disposable tonnage in only 20 months.

'At this rate it could be argued the whole amount would be disposed of in seven years. Unfortunately for the US Government, lower world prices this year have cut the previous disposal rate by almost two-thirds.

'To make future disposal even more difficult for them there is the prospect of large quantities of commercially competitive polyisoprene and polybutadiene synthetics being available next year. What the world markets now need is a positive announcement to cure the present jitters and allow the trade to assess the overall picture clearly'.

Rubber Statistics

WORLD SITUATION DURING MARCH 1961

THE following advance information on the world rubber situation during March, and the latest revised figures for February 1961 have been issued by the Secretariat of the International Rubber Study Group (in long tons).

NATURAL RUBBER	February 1961	March 1961
Production	147,500	—
Deliveries from stockpiles[1]	1,000	1,000
Consumption	157,500[2]	167,500[2]
STOCKS END-PERIOD		
In producing areas	282,500	262,500
In consuming areas	225,000	225,000
Afloat	197,500	—

[1]Deliveries from the Government stockpiles of the US and the UK.

[2]Including estimated imports into the Soviet Union of 21,000 long tons in February, 1961, and estimated imports into China of 4,500 in February and 3,250 long tons in March.

SYNTHETIC RUBBER	February 1961	March 1961
Production	142,500	155,000
Consumption	140,000	152,500
STOCKS END-PERIOD	355,000	357,500

Reported exports of rubber from Indonesia during February 1961 amounted to 41,598 long tons of which 13,957 long tons were of estate origin.

United States

The United States Rubber Manufacturers' Association reports that the total consumption of new rubber in May amounted to 126,335 tons against 116,020 tons in April. Consumption in May comprised 35,335 tons of natural rubber and 91,000 tons of synthetic (including 74,675 tons of SBR). April consumption comprised 33,207 tons of natural and 82,813 tons of synthetic (including 68,287 tons of SBR).

Total synthetic rubber production in May was 109,470 tons against 108,453 tons in April, while production of SBR was 89,630 tons compared with 87,742. Total synthetic rubber exports in May were 24,740 tons against 23,241 tons in March.

Thailand

Thailand exported 12,178,336 kilos of rubber of all grades during April this year, according to trade estimates.

This compared with 21,700,740 kilos exported in March and 11,270,817 kilos in April 1960. Main countries of destination in April 1961 included (April 1960 given as comparison; figures in kilos):

	April 1961	April 1960
USA	4,185,360	3,169,009
Japan	3,110,584	3,205,645
West Germany	993,006	1,030,547
UK	1,463,605	25,515
Malaya	918,978	748,886
Singapore	523,638	1,837,717

Rubber Markets

LONDON

Trading remained at a low ebb and an easy trend continued in sympathy with lower Eastern prices. Minor upturns were short-lived. Although the decline brought in some shortcovering interest, and switching of Terminal positions, not much movement of physical rubber was noted. This reflected the general slackness of enquiry from United Kingdom and Continental factories.

Latest prices are as follows:

No. 1 RSS Spot: 24½d.-24⅝d.

Settlement House:

August 24⅝d.-24¾d.
September 24⅝d.-24¾d.
October 24⅝d.-24¾d.
October/December 24¾d.-24⅞d.
January/March 24¾d.-25d.
April/June 24¾d.-25d.

No. 1 RSS cif basis ports:

July 24½d.-24⅝d.
August 24⅝d.-24¾d.

Godown:

July 82¼ Straits cents nominal.

LATEX

Centrifuged 60% latex per gallon in drums, seller, August, 14s. 1d., cif European ports. Spot, seller, 14s. 9d. Bulk, seller, d.w. 14s. 1d. Normal, seller, August, 11s. 5d.

NEW YORK

The New York rubber market ruled as under on June 26:

DEALERS' PRICES

	US cents per lb., ex-dock	
	June 26	Previous
No. 1 RSS, July	29½b–29¼a	29¼a
Aug.	29t	28¾b–29¼a
No. 2 RSS, July	29¼b–29¾a	29¾a
Aug.	28½n	28¾b–29¼a
No. 3 RSS, July	29b–29¼a	29¼a
Aug.	28¾n	28½b–29a
No. 1 RSS, Spot	—	29¾n
No. 3 amber blanket crepe, July	25¼n	25¼n

FUTURES—REX CONTRACT

	June 26	Prev. Close
July ..	29.85b–30.00a	29.90b–30.20a
Sept. ..	28.80b–29.00a	29.00t
Nov. ..	28.60–28.65t	28.65b–28.85a
Jan. ..	28.55b–28.75a	28.55t

Sales: 15. Tendency: Steady.

Futures were barely steady in meagre dealings on June 26. Physical rubber was quiet and barely steady. In late dealings, physical rubber was about steady and quiet.

SINGAPORE

The market was very quiet and featureless throughout the morning of June 26, although there was rather better interest in lower sheets at slightly narrower discounts. The turnover was restricted, reflecting sellers' reserve. The market closed the morning session quite steady. Very quiet conditions prevailed in the afternoon and prices showed a steadying tendency later. Lower sheet interest was small.

	Malayan cents per lb., fob Malayan ports to open ports	
	June 26	Prev. Close
No. 1 RSS, July ..	84 –84½	84 –84½
Aug. ..	84½–84⅝	84½–84⅝
No. 2 RSS, July ..	83⅝–83⅞	83½–83⅞
No. 3 RSS, July ..	83 –83½	82½–83½
No. 4 RSS, July ..	79⅜–80½	79½–80½
No. 5 RSS, July ..	70½–71½	71 –72
No. 1 RSS, Spot ..	83⅞–84½	83½–84½
No. 3 blanket thick remilled crepe, July	70½–71½	71 –72
No. 1 fine pale crepe, July	92 –93	91½–92½
2x thin brown, July..	67½–68½	67½–68½

Tendency: Quiet but steady.

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob at 165.20d. per allon.

AMSTERDAM

The Amsterdam rubber market ruled as under on June 26:

	Guilders per kilo	
No. 1 RMA	June 26	Previous
June	2.30	2.30
July	2.31	2.31
August	2.31	2.31
September	2.31	2.31
July/Sept.	2.31	2.31
October	2.31	2.32

Sales: Nil. Tone: Quiet.

DJAKARTA

The market was generally quiet on June 26 due to lack of demand, but about 50 tons of sheet No. 1 were sold at between 33.25 and 33.75 rupiahs per kilo.

	Rupiahs per kilo	
	June 26	Previous
No. 1 Priok, Spot ..	32.50b	32.00b
No. 2 Priok, Spot ..	31.50b	31.00b
No. 3 Priok, Spot ..	30.50b	30.00b
No. 1 fine pale crepe, Spot	30.00b	30.00b

Tendency: Quiet.

CEYLON

The price of No. 1 RSS at Colombo on June 26 was 101 (101½) Ceylon cents per lb.

BANGKOK

The price of No. 1 RSS at Bangkok on June 26 was 27.00 (27.00) US cents per lb.

MALAYSIA REJECTS OFFER

THE Malaysia Rubber Co. Ltd. has rejected an offer for its estate.

J. R. Tannock, chairman, in a letter to shareholders, says: 'Our Eastern agents have tried without success to establish the identity of the Chen Tiaw syndicate whose circular sought to promote the sale of your company's estate. The offer referred to in that circular is below the board's valuation of the estate and has been rejected'.

Prudent Replanting Policy

'The reference in the Chen Tiaw circular to the company's costs being "unusually high for its yield per acre of rubber" is untrue', continues Mr Tannock. 'The company is a relatively cheap producer and the agricultural condition of the property is excellent. The crop harvested has risen from 561,000lb. in 1956 to 723,000lb. in 1960. Output should increase as new areas mature following the prudent replanting policy pursued by your board, and this should have an increasingly beneficial effect on unit costs of production'.

The board has complete confidence in the company, Mr Tannock adds. Over a period of months bids from a number of intermediaries have been received and these bids have risen from $2m. to $2.3m. If a worthwhile offer for the estate is received, Mr Tannock says, the directors will recommend its acceptance by shareholders.

Three Films

Two new Dunlop films have been issued by The Dunlop Film Library, Wilton Crescent, London, S.W.19.

'Montage No. 4' is the fourth in the 'Dunlop Pictorial' series and the first to include an animation sequence. The subjects covered include the Dunlop symbol, undersealing a car, and a sleep investigation.

The other film has been produced by Armand and Michaela Denis and is called 'On Safari'.

'Project Nigeria', a film showing the start of Dunlop's £4m. Nigerian plantation scheme, where 20,000 acres of virgin jungle are being cleared and planted with rubber, will be released in the autumn.

Radyne Ltd.

Radio Heaters Ltd. has changed its name to Radyne Ltd. Radyne is the company's trade mark for plastics HF welding equipment.

Industry INTELLIGENCE

Technical Data

Esso Butyl

Esso Petroleum Co. Ltd., Chemicals Department, 50 Stratton Street, W.1, has issued technical information sheets Nos. 42 and 45, entitled Enjay Chlorobutyl (MD551) Steam Hose, and Bloom Reduction in Low-Cost Fast-Curing Enjay Butyl Moulded Goods respectively.

The heat resistance of chlorobutyl (MD551) has made it suitable for use in steam hose compounds. Three basic formulations have been developed for steam service — a carbon black-loaded cover stock, a hydrated silica-loaded stock, and a hydrated silica-loaded tube stock. These compounds have been found to perform very well under stimulated static service conditions.

High concentrations of sulphur and accelerator sometimes used to produce fast cures in butyl vulcanizates often cause a bloom to appear on the surface. The report on bloom reduction indicates methods which should eliminate this bloom in typical low-cost fast-curing butyl moulded goods.

Sorbitol Monostearate

Croda Ltd., Cowich Hall, Snaith, Goole, Yorkshire, has issued a technical data sheet on Crill S.8, which is polyoxyethylene sorbitan monostearate, a water souble surface active agent, and one of a series of polyoxyethylene derivatives of Sorbitan partial esters. It is formed by the reaction of ethylene oxide on sorbitan monostearate.

The sheet gives information on composition, properties, function, manipulation and uses of Crill S.8.

Polysar Latex 722

Polysar technical report No. 65:5B available in this country from Polymer (UK) Ltd., Walbrook House, Walbrook, E.C.4, deals with slip resistance of Polysar Latex 722 carpet backings.

This report presents data relating slipping tendency to filler loading in a series of Polysar Latex 722 carpet backing compounds. They show that a recipe for a heavily loaded Polysar Latex 722 backing compound for large carpets can be modified to suit small carpets, just by reducing the filler loading to a level which will allow the compound to retain a desired degree of slip-resistance.

Pvc Plasticizers

A. Boake, Roberts and Co. Ltd., 100 Carpenters Road, E.15, has issued two technical information bulletins. No. 238 deals with alkyl maleates and No. 239 with Pliabrac 987.

The alkyl maleates are comonomers and internal plasticizers for vinyl acetate polymers, reactive intermediates for chemical synthesis and wetting agent intermediates. Pliabrac 987 is the latest addition to the Abrac range of low-viscosity plasticizers which impart good low-temperature properties and a high degree of resilience to pvc compounds.

Machines, Materials and Equipment

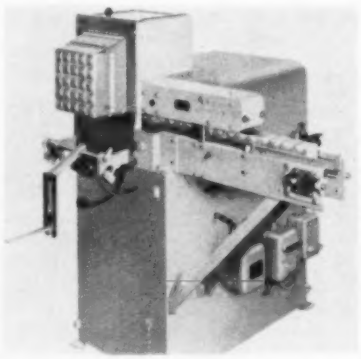
Ceramic Magnet Pulleys

Rapid Magnetic Ltd., Lombard Street, Birmingham, has introduced a new range of Andox 5in. permanent magnet pulleys for extracting tramp iron from processed materials. The units include magnets made of anisotropic barium ferrite ceramic material, the coercivity of which permits a radial pole construction as distinct from the axial disposition adopted with Alcomax magnets.

The field intensities so produced are claimed to be equivalent to those of electromagnetic designs, with flux distribution patterned to conform to the burden contour on the belt conveyor. Highest intensity is said to occur at the centre of the conveyor where burden depth is greatest. The pulleys are available in a range of sizes from 12in. to 24in. diameter for any belt width.

Carton Caser

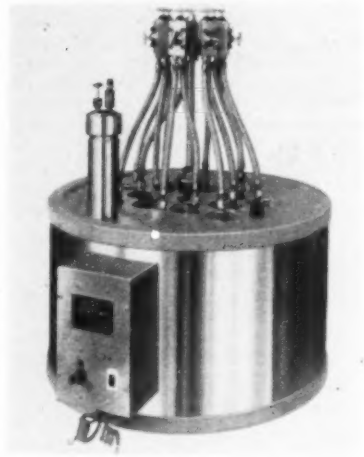
A versatile packet and carton caser is now available from H. W. Wallace and Co. Ltd., 172 St. James's Road,



Croydon, Surrey. The equipment consists of a main unit to which can be quickly fitted any variant in the form of change parts that give an almost limitless range, from a ¼in. sq. meat cube to a breakfast cereal package. Time required for changing parts is about seven minutes. Claimed to be capable of handling any type of package whether cartoned, paper or film wrapped, so long as it has a positive shape, the machine will pack them into fibreboard and corrugated cases or into multi-wall paper or plastics bags if required.

Pressure Ageing Oven

Scott Testers Inc. has introduced model LGP pressure ageing oven that



features a pressure system with all components of stainless steel to eliminate metal contamination of specimens under test. This was designed specifically to conform with ASTM Methods of Test D572 and D454, and employs 14 pressure cylinders.

Further information on the oven may be obtained from Scott Testers Inc., 124 Blackstone Street, Providence, R.I.

Publications

Visolyte Film

A new folder entitled 'Clear Visolyte Film' is available from Visking Department, Union Carbide International Co., 270 Park Avenue, New York 17, N.Y.

In it the many features of this biaxially oriented polystyrene film are described.

The folder gives the film's characteristics which are claimed to include good clarity and gloss, high yield and low cost, good low temperature performance and printability without pretreatment. Some of the suggested applications in packaging and overwrapping for various industries are also mentioned.

Polythene Glycols

A new booklet, describing the properties and uses of Carbowax polythene glycols, has recently been made available by the Chemicals Department, Union Carbide International Co., 270 Park Avenue, New York 17, N.Y.

The booklet contains data on Carbowax polythene glycols 200, 300, 400 and 600, which are liquids; and 1000, 1500, 1540, 4000 and 6000, which are solids at room temperature. Carbowax methoxy polythene glycols 350, 550, and 750, and polythene glycol compound 20M are also covered.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

Tecalon (811,487). Flexible pipes and tubes, all made from extruded plastics; flexible pipes and tubes, all made from extruded plastics and braided or reinforced with metal wire or with textile filaments; flexible pipes and tubes, all made from extruded plastics and braided or reinforced with metal wire or with textile filaments and formed as multiple assemblies; parts of all the aforesaid goods; all included in Class 17. Tecalemit Ltd., Plymouth, Devon. (Class 17; April 19 1961.)

Uvisorb (816,592). Chemical products for use in the textile, leather, paper and plastics industries; chemical compounds used as light-absorbing agents. Ciba Ltd., 141 Klybeckstrasse, Basle, Switzerland. (Class 1; April 26 1961.)

(B800,440). Piston rings; retaining rings being machinery fittings for locking the packings on shafts, and springs (parts of machines) made of rubber or of rubber and metal. Simmerwerke W. Simmer KG, 43 Untere Sparchen, Kufstein, Austria. (Class 7; April 26 1961.)

Allospan (807,838). Plastics in the form of blocks, sheets, films, panels, rods and tubes, all for use in manufacture. Ingeborg Krages, trading as Thermopal-werk, Leutkirch/Allgäu, Germany. (Class 17; April 26 1961.)

Kauthene (814,391). Pipes, and parts and fittings therefor, all included in Class 17, all being made of plastics and having acid-resisting properties. Kautex Plastics Ltd., Empire Works, 9 Deansbrook Road, Edgware, Middlesex. (Class 17; April 26 1961.)

Crystalon (806,908). Small domestic utensils and containers, all made of plastics; and porcelain and earthenware, all included in Class 21. Trans Carbo Components Ltd., 28 Brazennose Street, Manchester, 2. (Class 21; April 26 1961.)

Symfar (813,600). Plastics-coated upholstery fabrics being textile piece goods. Symfar Plastics Ltd., 38 King Street West, Manchester, 3. (Class 24; April 26 1961.)

Renopac (812,329). Containers included in Class 20 made wholly or principally of plastics. John Waddington Ltd., Waddington's Printing Works, Wakefield Road, Leeds, 10, Yorkshire. (Class 20; May 3 1961.)

Renopac (812,330). Containers included in Class 21 made wholly or principally of plastics, John Waddington Ltd., Waddington's Printing Works, Wakefield Road, Leeds, 10, Yorkshire. (Class 21; May 3 1961.)

Oxitex (810,618). Chemical products for use in industry. Shell International Petroleum Co. Ltd., St. Helen's Court, Great St. Helen's, London, E.C.3. (Class 1; May 24 1961.)

Eversan (812,116). Chemical compounds for use in the course of manufacture of textile fabrics, rubber products, plastics and of elastomeric products. Yardney International Corporation, 40-48 Leonard Street, New York, 13, State of New York, USA. (Class 1; May 24 1961.)

Fluorosint (813,568). Mixtures of polytetrafluorethylene resins and fillers included in Class 1, being goods for use in manufacture. The Polymer Corporation, 2120 Fairmount Avenue, Reading, State of Pennsylvania, USA. (Class 1; May 24 1961.)

Rebil-Dex (B798,794). Remoulded pneumatic tyres for vehicle wheels. Compagnie Générale des Etablissements Michelin, 4 Rue du Terrail, Clermont-Ferrand, Puy-de-Dôme, France. (Class 12; May 24 1961.)

NEW COMPANIES

Alstons Courtlands Ltd. (691,896). May 8. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, rubber goods of all kinds, surgical appliances, corsetry, etc. The directors are: Thomas A. Alston and Eleanor M. Alston, both of 92 Church Street, Willingdon; Mary T. Alston and Alice M. Alston, both of 14 Wilton Crescent, Eastbourne. Regd. office: 20 Upperton Road, Eastbourne.

Heelcraft (Leicester) Ltd. (691,547). May 5. Capital: £10,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics and wooden heels, fibre and built-up heels, plastics soles, etc. Regd. office: 5 St. Nicholas Street, Leicester.

Cravens (Machines) Ltd. (691,817). May 5. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, and operators of machines, machine tools, and equipment for the plastics, engineering, chemical, foundry, metalworking and paper industries, etc. The first directors are to be appointed by the subscribers.

E. Goldfarb and Co. Ltd. (690,211). April 19. Capital: £10,000 in £1 shares. To carry on the business of manufacturers, wholesalers, retailers, importers, exporters and repairers of, and dealers in, all kinds of leather, plastics and other material, trunks, bags, wallets, etc. The directors are: Eugen Goldfarb, 2 Fairgreen East, Cockfosters, Herts.; Emma L. Thompson, 192 Langham Road, N.15; John J. Strauber, 2 Fairgreen East, Cockfosters, Herts. Regd. office: 4 Shelford Place, Stoke Newington Church Street, N.16.

Hawleys (Tyre Services) Ltd. (690,399). April 20. Capital: £10,000 in £1 shares. The directors are: Reginald Hawley, 136 Rural Lane, Sheffield; David Hawley, 24 Oldfield Grove, Stannington, Sheffield; Leslie Black, 416 London Road, Sheffield. Regd. office: 53 Bridge Street, Sheffield.

Rock Ridge Rubber Co. Ltd. (690,369). April 20. Capital: £100 in £1 shares. The first directors are: Anthony J. Collinson, 5 Goodyers Avenue, Radlett; Leonard A. Collison, 106 Central Avenue, Athol, Johannesburg, South Africa. Regd. office: 6 Mortlake High Street, S.W.14.

H. A. Foy and Co. Ltd. (693,249). May 19. Capital: £5,000 in £1 shares. To carry on the business of metal and plastics recovery specialists, etc. The directors are: Dennis E. Vaughan, 5 Birbetts Road, Eltham, S.E.9; Henry A. Foy, 62 Clifton Way, Peckham, S.E.15 (director of V.W.F. Recoveries Ltd.). Regd. office: 62 Clifton Way, Peckham, S.E.15.

Charles E. Tresise Ltd. (693,102). May 18. Capital: £100 in £1 shares. To carry on the business of manufacturers' agents for the printing, packing and plastics industries, etc. Regd. office: 16 Northumberland Avenue, W.C.2.

Meteor Tyre Co. Ltd. (693,202). May 18. Capital: £1,500 in £1 shares. To carry on the business of manufacturers of, and dealers in, tyres, etc. The directors are: Henry K. Knight and Joan Knight, both of 680 Wells Road, Knowle, Bristol. Regd. office: Clothier Road, Brislington, Bristol.

Plastic Supplies (Bristol) Ltd. (693,126). May 18. Capital: £7,500 in £1 shares. The directors are: Stanley A. Deacon and Mrs Menna E. J. Deacon, both of 202 Cranbrook Road, Redland, Bristol.

Martin Starr Ltd. (693,498). May 24. Capital: £100 in £1 shares. To carry on the business of manufacturers of, and dealers in, plastics, etc. The directors are: Martin Starr and Minnie Starr, both of 103 Bourneside Road, Addlestone. Regd. office: 103 Bourneside Road, Addlestone.

Household Plastics Ltd. (692,839). May 16. Capital: £1,000 in £1 shares. To carry on the business of manufacturing, setting, moulding and shaping solid and liquid thermoplastics, and thermosetting materials, etc. The directors are to be appointed by the subscribers.

Tyre Services (Falkirk) Ltd. (693,272). May 19. Capital: £100 in £1 shares. The directors are: John Blacklock and Mrs Winifred Blacklock, both of 58 Scotby Road, Scotby, Carlisle. Regd. office: Durranhill Industrial Estate, Carlisle.

COUNTY COURT JUDGMENTS

NOTE.—*These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.*

The Southern Battery and Tyre Co., s/a firm, 14 Thornhill Road, Southampton, Hants. Southampton, £27, January 26 1961.

Wardle (Plastics) Ltd., Market Street, Southport, Lancs. Liverpool, £45, February 6 1961.

Lightweight Plastics Ltd., Ilfracombe, Devon, plastics manufacturers. Barnstaple, £19, February 6 1961.

C.R. Plastics, 110 Marlborough Road, London, N.19. Brighton, £84, November 16 1960.

Auto Tyre and Car Services (Oxford) Ltd., Gloucester Lane, Gloucester Green, Oxford. Oxford, £19, February 7 1961.

Plastmet (Phenolics) Ltd., 43 St. James Street, Walthamstow, London, E.17. Bow, £42, January 24 1961.

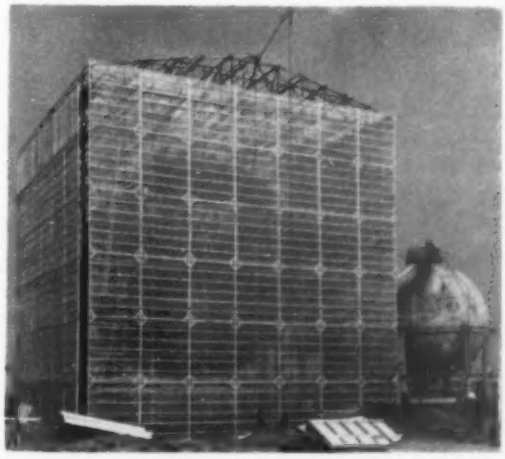
Southern Battery and Tyre Co., 14 Thornhill Road, Southampton, Hants. Southampton, £28, February 21 1961.

Redditch Rubber Co., Green Lane, Studley, Warwicks. Redditch, £39, February 22 1961.

H. J. Duplessis (T/A **The Plastic Pool Co.**), Portmore, Lymington, Hants. Westminster, £13, February 6 1961.

Southern Battery and Tyre Co., 14 Thornhill Road, Southampton, Hants. Gloucester, £38, February 13 1961.

Fibrin Plastics Ltd., Brown Hill, Bridge Mill, Dobcross, Yorkshire West Riding, general fibre glass moulders. Oldham, £22, February 8 1961.



To give weather protection to men erecting this butadiene storage sphere for I.C.I. Heavy Organic Chemicals Division at Wilton this shelter has been constructed. Each panel consists of heavyweight polythene building sheet made by British Visqueen Ltd. and is attached to a light timber frame. This in turn is secured to the scaffolding round the sphere

Increases of Capital

Golden Hope Rubber Estate Ltd. (86,188), 1-4 Great Tower Street, E.C.3. Increased on September 9 1960, by £250,000 in 2s. ordinary shares, beyond the registered capital of £1,000,000.

Cambridge Convertor Co. Ltd. (678,699), converters of, and dealers in, plastics, etc., Victoria Road, South Ruislip, Middlesex. Increased on October 17 1960, by £19,000 in £1 shares, beyond the registered capital of £1,000.

R. H. Cole and Co. Ltd. (295,696), 2 Caxton Street, S.W.1. Increased on October 27 1960, by £150,000 in 75,000 'A' ordinary and 75,000 'B' ordinary shares of £1 each, beyond the registered capital of £100,000.

Curfew Tyre and Rubber Co. Ltd. (653,184), 33 Pyrecroft Road, Chertsey, Surrey. Increased on October 6 1960, by £10,000 in £1 ordinary shares, beyond the registered capital of £10,000.

Phoenix Rubber Co. Ltd. (377,912), 186 High Street, Bromley, Kent. Increased on October 17 1960, by £50,000 in 5s. ordinary shares, beyond the registered capital of £50,000.

Ouvah Ceylon Estates Ltd. (490,746), 21 Mincing Lane, E.C.3. Increased on October 11 1960, by £270,000 in £1 ordinary shares, beyond the registered capital of £600,000.

Changes of Name

Provincial Tyre Co. (Newcastle) Ltd. (574,937), 781 Salisbury House, London Wall, E.C.2. Name changed to C. Neild Tyre and Rubber Co. Ltd. on October 19 1960.

Aeropreen Products Ltd. (565,269), Plantation House, Rood Lane, E.C.3. Name changed to Aeropreen Ltd. on October 19 1960.

Liverpool Latex Cushion Co. Ltd. (590,379), Don Mill, Middleton, Manchester. Name changed to Genefoam Ltd. on October 21 1960.

Wessex Plastics Ltd. (401,019), Abbey Yard, Bath. Name changed to Wessex Machine Tools Ltd. on October 20 1960.

Latest Wills

John Cunningham Young, of 36 Dan-y-Coed Road, Cardiff, district manager for the India Tyre and Rubber Co. Ltd. at Cardiff, who died on February 22 1961, left £10,638 net value.

Mrs Marian Gertrude Victoria Pym, of Doods, Reigate, Surrey, widow of David Pym, former director of the Kuala Kubu Rubber Estate Ltd., who died on February 24 1961, left £88,888 net value.

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ASSISTANT works manager required to train as works manager. Factory in North London employing approximately 200 on shift work. Previous practical works experience necessary and knowledge of soft rubber and/or plastics moulding advantageous. Age about 30/45. Commencing salary £1,500 or depending upon qualifications.—Details of education, past experience, positions held with dates to Box No. CL. 1673, Haddon's, Haddon House, 2/4 Fitzroy Street, London, W.1. (1120)

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CLARK Petrol Forklift Truck. 2,000lb. capacity. 9ft. lift. Solid rubber tyres. Good working condition throughout. £550.—Speed Electrics, Dept. RJ, Church Street, Basford, Nottingham. Tel. 75716. (1131)

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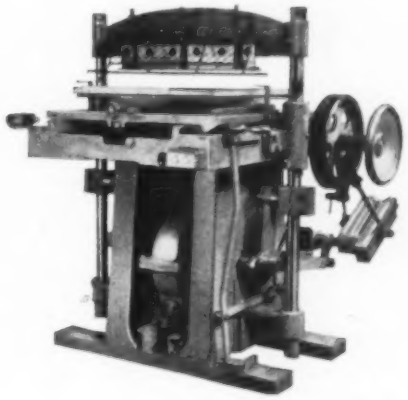

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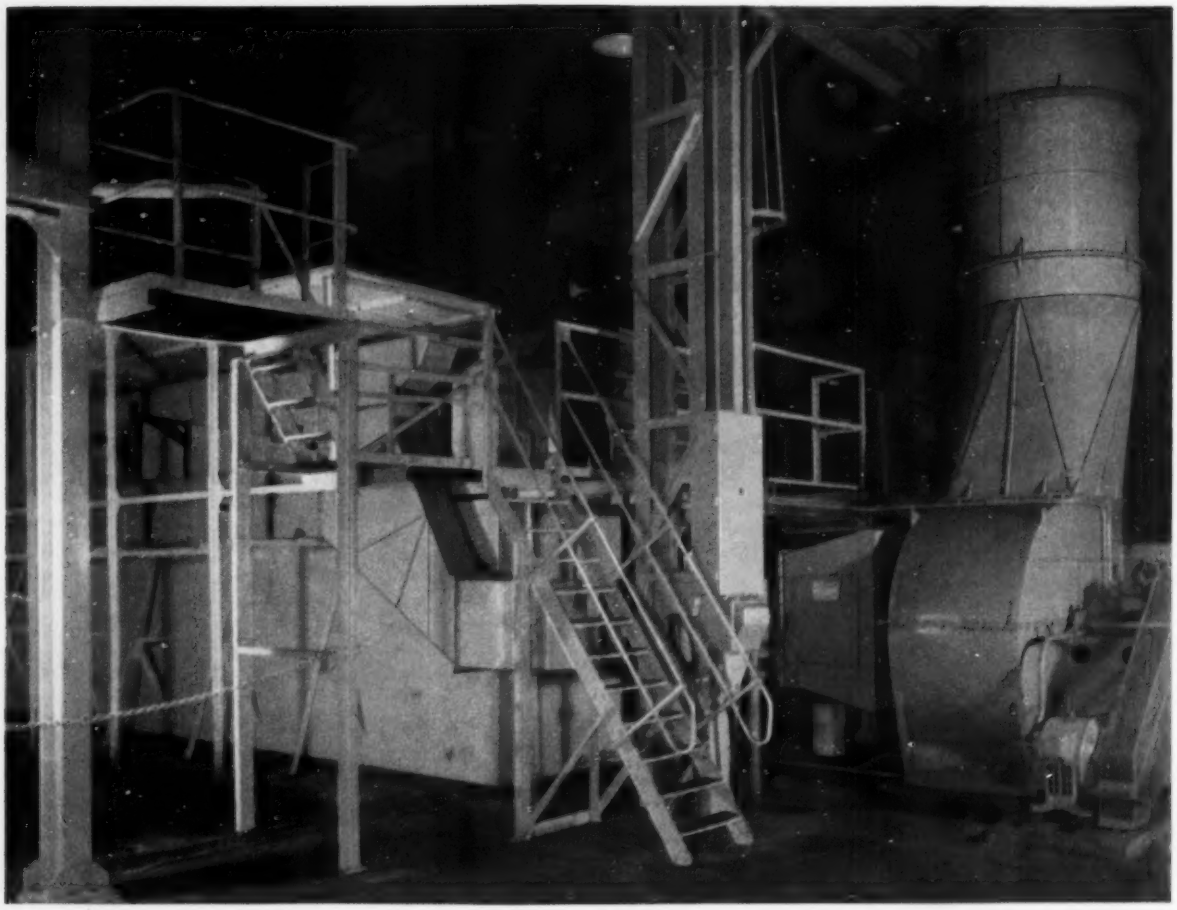
Fume extraction equipment made and installed by Acalor (1948) Ltd., Kelvin Way, Crawley, Sussex, at the War Department Steel Preservation Plant at Long Marston. The equipment comprises long lengths of p.v.c. ducting and six separate chimneys 4' 6" diameter and 30' high with 6' x 6' top outlets on the roof.



'Darvic' beats acid corrosion at Steel Preservation Plant

This fume extraction equipment is installed at the War Department Steel Preservation Plant to carry away the fumes from baths of acid in which bridge sections are dipped. The ducts, chimneys and roof outlets are all made from 'Darvic' p.v.c. sheet.

'Darvic' resists most forms of chemical attack. It is also tough, rigid even in thin sheets, and is unaffected by weather. Ducting made from 'Darvic' can be installed quickly, needs no painting and is light in weight.

'DARVIC'

'Darvic' is the registered trade mark for the rigid p.v.c. sheet manufactured by I.C.I.

PD94

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